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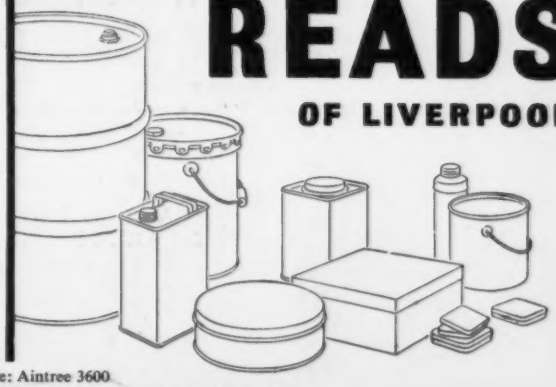

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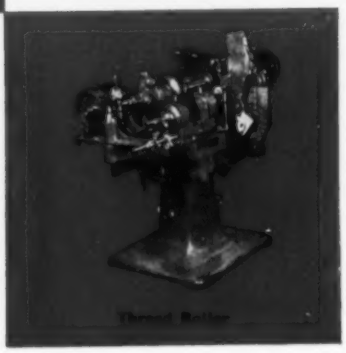

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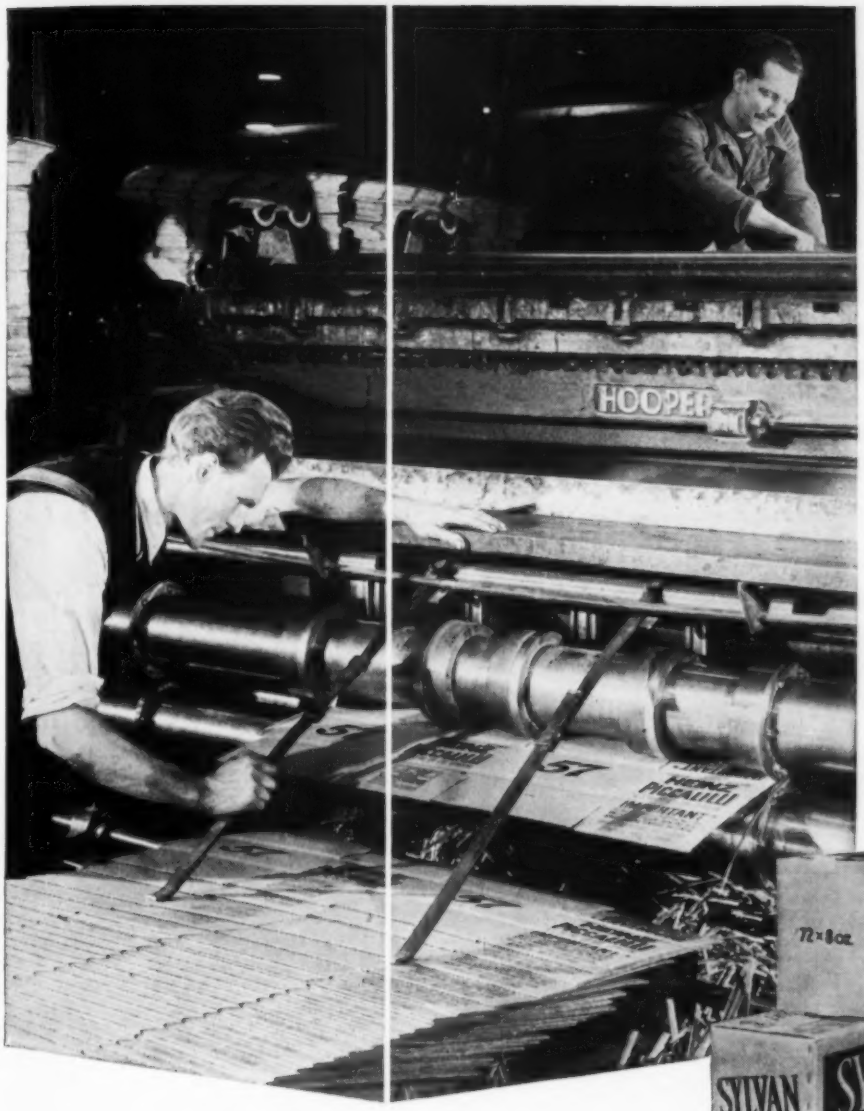

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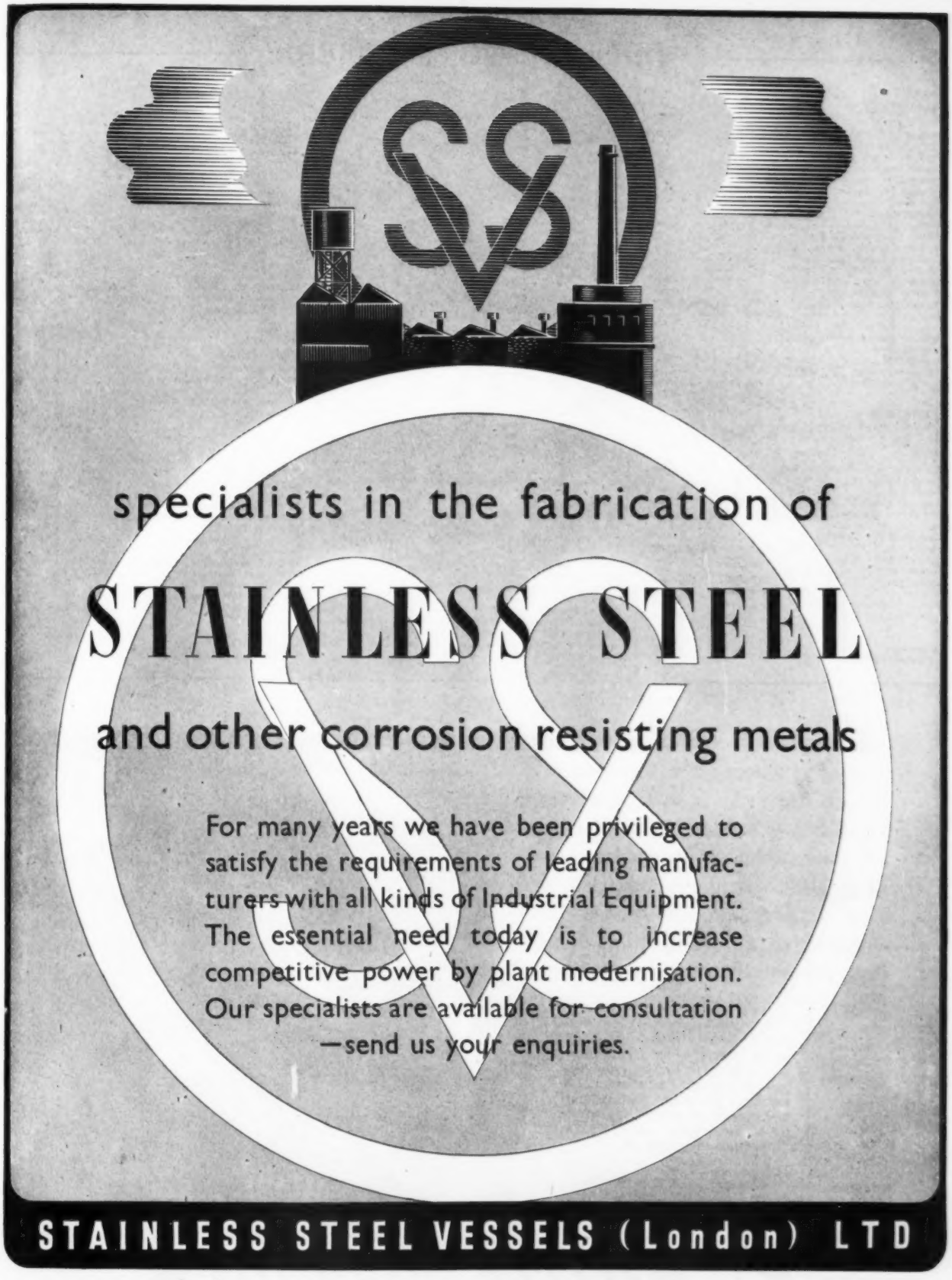
Index to ADVERTISERS

	Page
Acalor, Ltd.	June
Accles & Pollock, Ltd.	Nov.
Adams, Alfred & Co. Ltd.	Nov.
Advita, Ltd.	lxxxii
Aerograph Co., Ltd.	June
Agricultural & Chemical Products, Ltd.	ci
Airship Flour Co. Ltd.	lxxxvi
Albro Fillers & Engg. Co., Ltd.	Dec.
Alexander, L., & Co.	Sept.
Alfa-Laval Co., Ltd.	lxxiv
Alginate Industries Ltd.	Dec.
Alite Machines, Ltd.	Dec.
Allen, Stafford & Sons, Ltd.	li
Anderson, C. F., & Sons, Ltd.	Dec.
Angel Warehouse Co., Ltd.	ci
A.P.V. Co., Ltd.	xv
Arabol Mnfg. Co., Ltd.	Dec.
Associated Metal Works, Ltd.	xcii
Attwood, A. L., & Co., Ltd.	lxxiv
Autopack, Ltd.	Aug.
Baldwin Instrument Co., Ltd.	xcviii
Bamag, Ltd.	Aug.
Barnett Trading Co.	June
Barron, W. S., & Son, Ltd.	Dec.
Barron & Shepperd, Ltd.	Aug.
Bastian & Allen, Ltd.	Dec.
Bear Honey Co., Ltd.	Dec.
Beddington Nut & Produce Co.	c
Begg, Cousland & Co., Ltd.	Dec.
Bellingham & Stanley, Ltd.	Dec.
Bennett Sons & Shears, Ltd.	Nov.
Bertrams, Ltd.	Oct.
Birlec, Ltd.	Dec.
Birmingham Chemical Co.	Aug.
Bliss, E. W. (England), Ltd.	Cover ii
Block & Anderson	lxxxvi
Boehm, Frederick, Ltd.	lxxviii
Bollans, R. W., & Co., Ltd.	Dec.
Bowaters Sales Co., Ltd.	iii, xxx
Boxfoldia, Ltd.	Oct.
Braby, Fredk., & Co., Ltd.	I
Bramigk & Co., Ltd.	xxxix
Bramwell, S., & Co., Ltd.	lxviii
Brewers' Food Supply Co., Ltd.	Dec.
Bridges, S. N., & Co., Ltd.	July
Brierley, Wm., Collier & Hartley, Ltd.	lxxviii
Brightside Foundry & Engg. Co., Ltd.	lii
Britannia Folding Box Co., Ltd.	lxxiv
British Belting & Asbestos, Ltd.	lxvii
British Electrical Development Association	xxxviii
British Fermentation Products, Ltd.	May
British Food Fair	June
British Hydrological Corporation	lxix
British Industrial Solvents, Ltd.	Sept.
British Jeffrey-Diamond, Ltd.	xci
British Miller Hydro, Ltd.	Feb.
British Ratin Co., Ltd.	June
British Thermostat Co., Ltd.	Oct.
British Thomson-Houston Co. (Mazda)	Nov.
British Thomson-Houston Co. (Rugby)	Oct.
British Wedge Wire Co., Ltd.	Dec.
British & Western European Trading Co.	Dec.
Broadbent, Thomas & Sons, Ltd.	xl
Brookhirst Switchgear, Ltd.	April
Brown & Forth, Ltd.	cii
Bryan, Wm., Ltd.	lxxxii
Bulmer, H. P., & Co., Ltd.	xcix
Burnett & Rolfe, Ltd.	Dec.
Bush, W. J., & Co., Ltd.	liv, lv
Butterfield, W. P., Ltd.	Dec.
Caleb Duckworth, Ltd.	Dec.
Calfos, Ltd.	vii
Cambitzi, G., & Co., Ltd.	Nov.
Cambridge Instrument Co., Ltd.	Nov.
Canning Town Glass Works, Ltd.	xc
Carr & Co.	April
Chamberlain & Willows	Dec.
Chemical Air Drying & Conditioning, Ltd.	May
Cinema-Television, Ltd.	Dec.
Clareswear Service	Dec.
Clarke-Built, Ltd.	vi
Clark, George, & Co., Ltd.	Dec.
Clark, T. & C., & Co., Ltd.	Dec.
Clean Overall Service, Ltd.	lxxxviii
Coates Bros., Ltd.	xxxii
Cohen, George, Sons & Co., Ltd.	cii
Collins, Thomas, & Co., Ltd.	July
Collis, J., & Sons, Ltd.	Feb.
Colt Ventilation	lxiv
Commer Cars, Ltd.	lxv
Container Recovery Service	xlv
Conway Jackson & Co., Ltd.	April
Cooper, McDougall & Robertson, Ltd.	Oct.
Co-operative Wholesale Socy.	Dec.
Cox Engg. Co., Ltd.	Dec.
Creamery Package Mnfg. Co., Ltd.	Dec.
Croda, Ltd.	Dec.
Crofts (Engineers), Ltd.	lxxxviii
Crompton Parkinson, Ltd.	lvi
Croxted Mnfg. Co., Ltd.	Oct.
Cumming, Parsons, Ltd.	lxxx
Dale, John, Ltd.	Dec.
Dalmas, Ltd.	Sept.
Daniel, H. E., Ltd.	Dec.
Danks, Edwin, & Co., Ltd.	Dec.
Dapag (1943), Ltd.	Nov.
Davey Paxman & Co., Ltd.	Sept.
Dawson Bros., Ltd.	xlviii
De La Rue, Thomas, & Co., Ltd.	Nov.
Deacon, A. G., & Co.	April
Dexion, Ltd.	c
Diamond Motors, Ltd.	Dec.
Dickinson, John, & Co., Ltd.	Aug.
Distillers Co., Ltd.	xc
Dodge Brothers (Britain), Ltd.	Nov.
Donaldson & Filer, Ltd.	June
Dowson & Mason Gas Plant Co., Ltd.	xxxv
Drayton Regulator & Instrument Co.	Dec.
Drums, Ltd.	Cover iii
Duche, T. M., & Son, Ltd.	lxxxiv
Electrical Contractors Association	Oct.
Electropower Gears, Ltd.	c
Electrothermal Engg., Ltd.	lxxxix
Ellison, George, Ltd.	May
Enamelled Metal Products Corp. (1933)	Oct.
English Grains Co., Ltd.	Dec.
Eva, Alfred, & Son, Ltd.	Dec.
Evan Cook's Packers, Ltd.	lxxiii
Evans Chemicals, Ltd.	xcviii
Evans, Wm., & Co., Ltd.	Nov.
Evershed & Vignoles, Ltd.	xii
Famor Food Products	Sept.
Feaver, John, Ltd.	Dec.
Feculose Co., Ltd.	Dec.
Federated Paints, Ltd.	Mar.
Fenner, J. H., & Co., Ltd.	lxxxviii
Ferrum, Ltd.	July
Fisher's Foils, Ltd.	Dec.
Fison, Edward, Ltd.	June
Flexello Castors & Wheels	Oct.
Ford Motor Co., Ltd.	Dec.
Fox, Samuel, & Co., Ltd.	June
Frankfurt International Fair	lxii
Fraser, J., & Son, Ltd.	lxxxviii
Frischmann, H.	xciv
Fuller, Horsey, Sons & Cassell	cii
Funditor, Ltd.	April
Gale & Mount, Ltd.	Nov.
Gardner, Wm., & Sons (Glos.), Ltd.	June
Gas Council	xiv
G.C. Engineering Co., Ltd.	Dec.
Gee Manufacturing Co., Ltd.	Dec.
General Electric Co., Ltd.	xxxvii
Giusti, T., & Son	July
Gloy & Empire Adhesives, Ltd.	civ
Glynn Co., Ltd., The	April
Good Taste Foods	Oct.
Gosheron, John, & Co., Ltd.	lxxxiii
Graham & Gillies, Ltd.	Nov.
Gresham & Craven, Ltd.	Dec.
Grew, James, & Co., Ltd.	Dec.
G.W.B. Electric Furnaces, Ltd.	Mar.
Hall, J. & E., Ltd.	lxiii
Hall & Lane, Ltd.	xcviii
Hamburger, M., & Sons	xc
Havinden, G., Ltd.	Dec.
Hawker & Co.	Dec.
Henlys	Oct.
Heston Aircraft Co., Ltd.	Cover iv
Heywood, W. H., & Co., Ltd.	June
Hilton, Wallace, & Co., Ltd.	Dec.
Hirst, Nevin D., Advtg., Ltd.	July
Holden, Arthur, & Sons, Ltd.	xxxvi
Honeywell-Brown, Ltd.	xxvii
Hopkinsons, Ltd.	lxxxi
Howards & Sons, Ltd.	lxxii
Hunt, John (Bolton), Ltd.	lviii
Hymatic Engg. Co., Ltd.	Nov.
Imperial Chemical Industries, Ltd.	xxvi
Industrial Tapes, Ltd.	Nov.
Insecta Laboratories, Ltd.	Dec.
Ionlite, Ltd.	viii
J. & R. (Butchers) Supplies, Ltd.	civ
Jackson, J. G., & Crockatt, Ltd.	July
Jenkins, Robert, & Co., Ltd.	Dec.
Jenner, A. & C., Co., Ltd.	xxxi
Jobling, James A., & Co., Ltd.	Nov.
Johnson, A., & Co., Ltd.	Nov.
Johnson & Johnson (Great Britain), Ltd.	Nov.
Johnsons (Darley Dale), Ltd.	xc
Jones, Samuel, & Co., Ltd.	xxxiv
Jordan, Frederick, & Co.	Aug.
Kane, Frederick C., Ltd.	Nov.
Kek, Ltd.	Dec.
Kellie, R., & Son, Ltd.	lxvi
Kestner's	xcv
Kimpton Bros., Ltd.	Dec.
King, Geo. W., Ltd.	Nov.
Lacy-Hulbert & Co., Ltd.	lxxvi
Lambert, L., & Co., Ltd.	lxxxvii
Lautier Fils, Ltd.	June
Lax & Shaw, Ltd.	Oct.
Legget Nicholson Partners, Ltd.	Nov.
Leiner, P., & Sons, Ltd.	June
Lenderink & Co., Ltd.	April
Lewin Road Sweepers, Ltd.	Oct.
Lewis, H. K., & Co., Ltd.	xcviii
Lewis & Tylor, Ltd.	Dec.
Livermore & Knight, Ltd.	Dec.
Locomotors, Ltd.	July
London Fancy Box Co., Ltd.	Dec.
Lyons Fair	Mar.
Lyric Snacks	July
Machinery (Continental) Ltd.	lix
Magnetic Valve Co., Ltd.	xcvii
Maitlands (Metal Works), Ltd.	xcii
Manesty Machines, Ltd.	Dec.
Marconi Instruments, Ltd.	Nov.
Mather & Platt, Ltd.	Dec.
Matling, Ltd.	Aug.
May & Baker, Ltd.	lxxxi
Medway Corrugated Paper Co., Ltd.	xliii
Medway Paper Sacks, Ltd.	June
Mellish, A. W., Ltd.	Oct.
Metafiltration Co., Ltd.	lxxxv
Metal Box Co., Ltd.	xix
Metal Closures, Ltd.	xxi
Metaxas, S. B.	Nov.
Midland Silicones, Ltd.	xlvi
Milk & Protein Products, Ltd.	xcv
Minerval Produce Co.	Sept.
Minnesota Mining & Mnfg. Co., Ltd.	Nov.
Mitchell, L. A., Ltd.	lxxv
Mitchell Engineering, Ltd.	lxi
Mono Containers, Ltd.	Oct.
Mono Pumps, Ltd.	lxxxvi
Monsanto Chemicals, Ltd.	Dec.
Morgan Fairest, Ltd.	Aug.
Morning Foods, Ltd.	Dec.
Morton Machine Co., Ltd.	Dec.
Morton, Robert, & Co., Ltd.	Dec.
Moss, Wm., & Sons, Ltd.	Dec.
Musgrave & Co., Ltd.	Mar.
National Adhesives, Ltd.	xlvii
National Corrugated Paper Co., Ltd.	Nov.
National Glass Works (York), Ltd.	xcvi
Negretti & Zambra, Ltd.	lxxxv
New Era Co., Ltd.	Feb.
Newalls Insulation Co., Ltd.	Dec.
Nipa Laboratories, Ltd.	Nov.
Norman Engg. Co.	Dec.
Northey Rotary Compressors, Ltd.	Oct.
Nu-Swift, Ltd.	cii
Oppenheimer Casing Co. (U.K.), Ltd.	Dec.
Ormerod Engineers, Ltd.	xcii
Osram Lamps	xxxvii
Oury, Millar, & Co., Ltd.	lxxi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Index to ADVERTISERS

	Page
Packaging Exhibition	xiii
Padley & Venables, Ltd.	xci
Page, Henry, & Co., Ltd.	xcii
Pascall Engineering Co., Ltd.	xcvi
Paterson Hughes Engg. Co., Ltd.	Dec.
Pearson Phillips, Ltd.	Sept.
Peerless & Ericsson, Ltd.	xciii
Permoglaze, Ltd.	xcii
Permutit Co., Ltd.	xx
Philips Electrical, Ltd.	Dec.
Pickles, Geo. W., & Co., Ltd.	Mar.
Pinewood Paper Co., Ltd.	Sept.
Plenty & Son, Ltd.	xciv
Pneumatic Scale Corporation	Nov.
Polak & Schwarz, Ltd.	Nov.
Porteus, G., & Sons, Ltd.	Dec.
Powlings Patent Processes, Ltd.	xvii
Premier Colloid Mills, Ltd.	Dec.
Premier Filterpress Co., Ltd.	Dec.
Pressed Steel Co., Ltd.	lxx
Pressoturn, Ltd.	lx
Pulsometer Engg. Co., Ltd.	civ
Purdy Machinery Co., Ltd.	Dec.
Quickfit & Quartz, Ltd.	Dec.
Quickset Water Sealers, Ltd.	Nov.
Quiz Electrics, Ltd.	Nov.
Rapid Magnetic Machines, Ltd.	Dec.
Rayner & Co., Ltd.	Dec.
Reads, Ltd.	Cover i
Realm Engineering Works, Ltd.	xciv
Red Breast Preserving Co., Ltd.	lxxx
Revai, A., & Co., Ltd.	May
Roberts, David, & Son	Nov.
Roneo, Ltd.	July
Rostron, John, & Sons, Ltd.	xciv
Rotameter Mnfg. Co., Ltd.	Dec.
Royles, Ltd.	xciii
Rozalex, Ltd.	Dec.
Rubber Improvement, Ltd.	June
Ryan, William, & Co.	cii
Samuelson, P., & Co., Ltd.	Nov.
Saniguard Appliances, Ltd.	Aug.
Saunders Valve Co., Ltd.	lxxix
Schenkers, Ltd.	April
Semtex, Ltd.	xviii
Senior Economisers, Ltd.	Dec.
Service Electric Co., Ltd.	Nov.
S.F.P. (Food Products), Ltd.	Nov.
Shell Chemicals, Ltd.	xli
Short & Mason, Ltd.	Nov.
Shuttle, E., & Co., Ltd.	xcvi
Sichel Adhesives, Ltd.	Dec.
SIG Wrapping Machines, Ltd.	Dec.
Silber, L. I., & Co., Ltd.	xcvi
Silverson Machines (Sales) Ltd.	Dec.
Simon, Henry, Ltd.	xxix
Skerman, C., & Sons, Ltd.	ciii
SMALL ADVERTISEMENTS	ci-ciii
Small Electric Motors, Ltd.	lxxvii
Smith Bros. & Co., Ltd.	Dec.
Soya & Protein Products, Ltd.	Nov.
Spa Gelatine	April
Spicer Food Company, Ltd.	May
Spirax-Sarco, Ltd.	xlix
Stainless Steel Vessels, Ltd.	v
Standard Bottle Co., Ltd.	Feb.
Standard Synthetics, Ltd.	lxxvii
Starch Products, Ltd.	May
Steels Engg. Products, Ltd.	Sept.
Stelcon Industrial Floors, Ltd.	x
Sterne, L., & Co., Ltd.	Feb.
Stevenson & Howell, Ltd.	lxxxiv
Stonehouse Bros., Ltd.	lxxix
Structural & Mechanical Development Engineers, Ltd.	xi
Sturge, J. & E., Ltd.	Dec.
Sturtevant Engineering Co., Ltd.	lxviii
Sweets, Ltd.	June
Tan-Sad Chair Co., Ltd.	Nov.
Taylor Rustless Fittings Co., Ltd.	Dec.
Teleflex Products, Ltd.	lxxxiii
Tenaplas (Sales), Ltd.	Dec.
Thames Board Mills, Ltd.	ix
Thomas, Richard, & Baldwins, Ltd.	Sept.
Thompson, John (Dudley), Ltd.	Nov.
Thompson & Norris Mnfg. Co., Ltd.	liii
Tingey & Co.	lxxxix
Tintometer, Ltd., The	Oct.
Tobal Products, Ltd.	lxxv
Trapinex Products, Ltd.	Nov.
Trapow, D., & Co., Ltd.	xcix
Tyne Truck & Trolley Co., Ltd.	June
U.D. Engg. Co., Ltd.	Aug.
Ultrasonics, Ltd.	Oct.
Union Food Machinery Co., Ltd.	xcvii
Unipectin, Ltd.	Aug.
United Glass Bottle Mnfrs., Ltd.	xxiv, lvii
United Indigo & Chemical Co., Ltd.	xxxiii
United Steel Companies, Ltd.	June
Universal Metal Products, Ltd.	Oct.
Universal Supplies, Ltd.	June
Valley Products, Ltd.	June
Venesta, Ltd.	xxv
Vickers-Armstrong, Ltd.	Dec.
Vigon, J. J.	ciii
Viscose Development Co., Ltd.	xxiii
Waeco, Ltd.	Sept.
Walker Crosweller & Co., Ltd.	xvi
Walworth, Ltd.	Oct.
Warwick Production Co., Ltd.	xlv
Watford Electric & Mnfg. Co., Ltd.	Sept.
Watten Emulsifying Machines, Ltd.	Aug.
Webster, Isaac, & Sons, Ltd.	civ
Weir, G. & J., Ltd.	lxxxvii
Wetter, J. C., & Co., Ltd.	Oct.
Whiffen & Sons, Ltd.	Dec.
White, Tomkins & Courage, Ltd.	xxii
Whittaker, Arthur	Dec.
Willcox, W. H., & Co., Ltd.	lxxvi
Williams (Hounslow), Ltd.	Dec.
York Shipley, Ltd.	xxviii
Young, B., & Co., Ltd.	April

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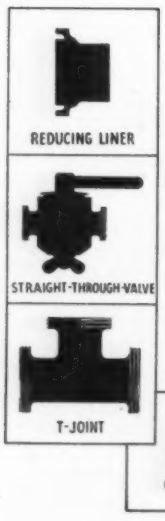

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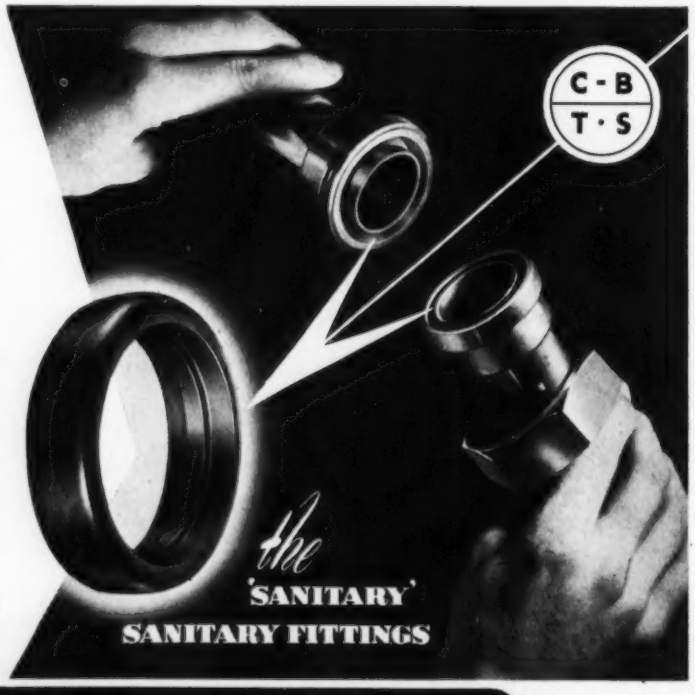

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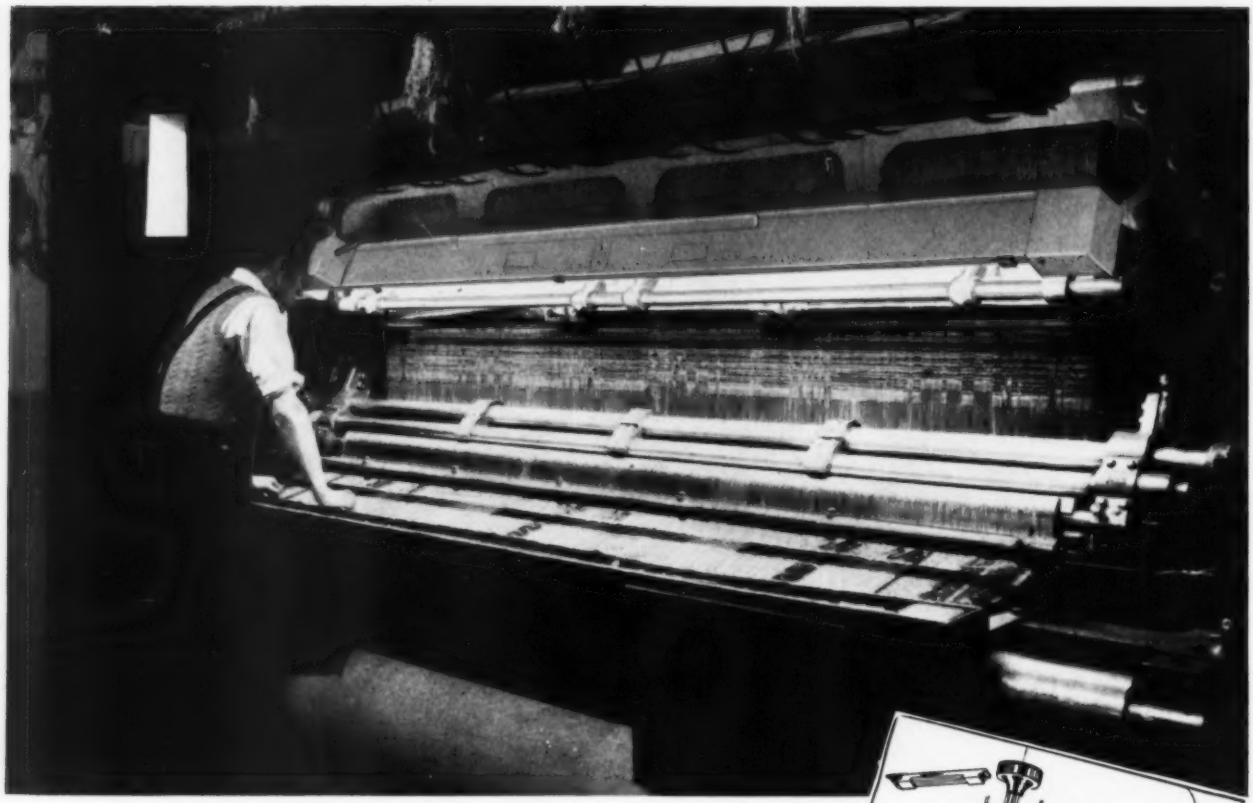

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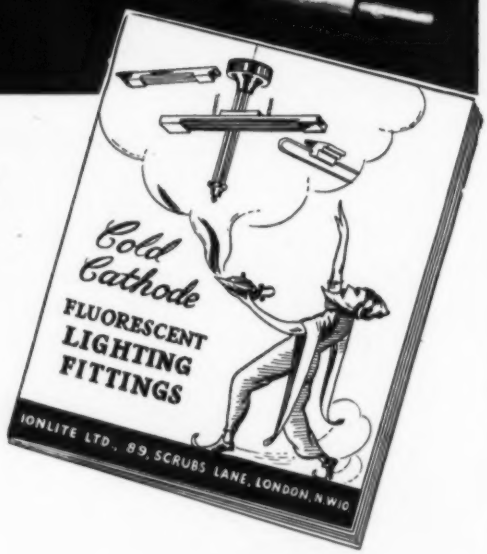

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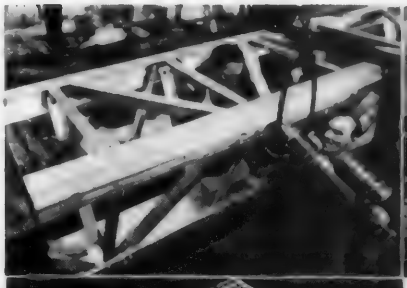
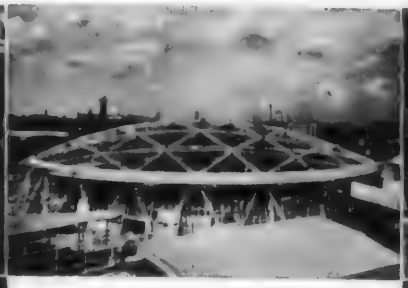

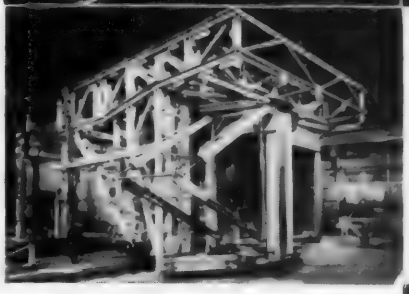

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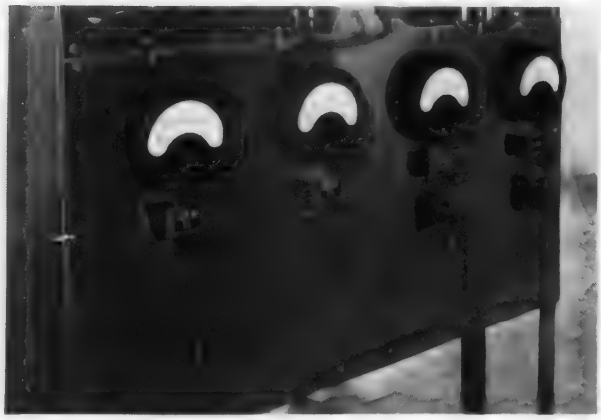
INDUSTRY'S MANY USES FOR EVERSHED CONTENTS GAUGES

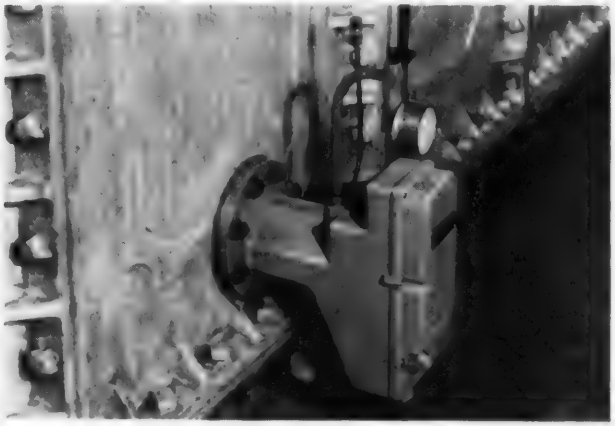
4 examples in oil and food manufacture

Evershed design and produce a wide range of equipment for measuring and distantly indicating at a required control point the levels of liquids in tanks and vessels or the interface between liquids in pressure vessels.

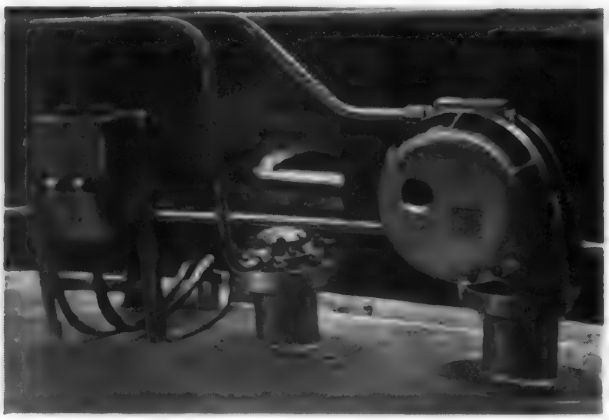
Four examples of the variety of ways in which this equipment is employed in industry are illustrated here. For a full account of the equipment send for your copy of SET OF CATALOGUES FM 50.



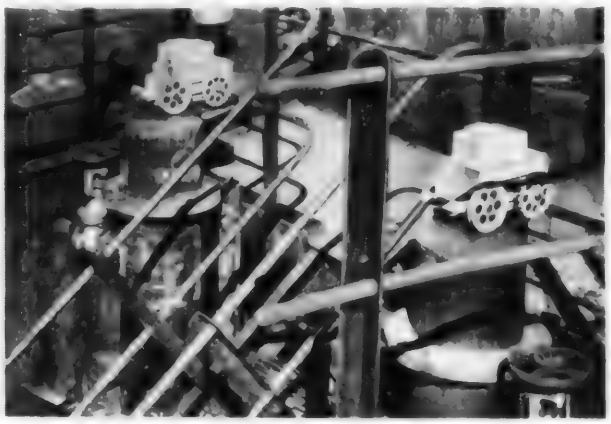
The main raw sugar and a large number of other bulk liquid storage tanks throughout at the entire Thames Refinery of Tate and Lyle are fitted with Evershed C. & S. type distant tank level indicators. The transmitters are fitted on the top of the tanks and are connected to indicators (those shown here are in the Sugar Recovery Plant) normally arranged in groups adjoining the tank control valves. The Evershed C. & S. transmitter is very easily installed, and its robust construction ensures reliable working under the severest conditions.



At their Plaistow Refinery, Messrs. Tate and Lyle Ltd. use the Evershed Tank Contents Gauge for indicating distantly the quantity of syrup in tanks. Troubles from contamination, heat, corrosion or viscosity are avoided by the use of this equipment, as no moving mechanism comes into contact with the liquid: it is therefore specially suited for indicating the contents of tanks containing syrups, paper pulp, slurries, soap or other viscous liquids.



An Evershed Precise Tank Gauge, as used in a Shell Refinery. This equipment is designed for measuring tank levels to an accuracy of 0·1 inches over a range of 50 ft. and recording the data distantly up to 10 miles.



The Grangemouth Oil Refinery of Scottish Oils Ltd., which produces 10% of the petroleum products of Great Britain, uses Evershed Electronic Repeater Level Transmitters (two are seen here) for centrally indicating the levels of liquids in the interlinked blending tanks. Other Evershed equipment used includes hortonsphere level transmitters in connection with liquid gas petroleum storage and Evershed flowmeters.

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6/61

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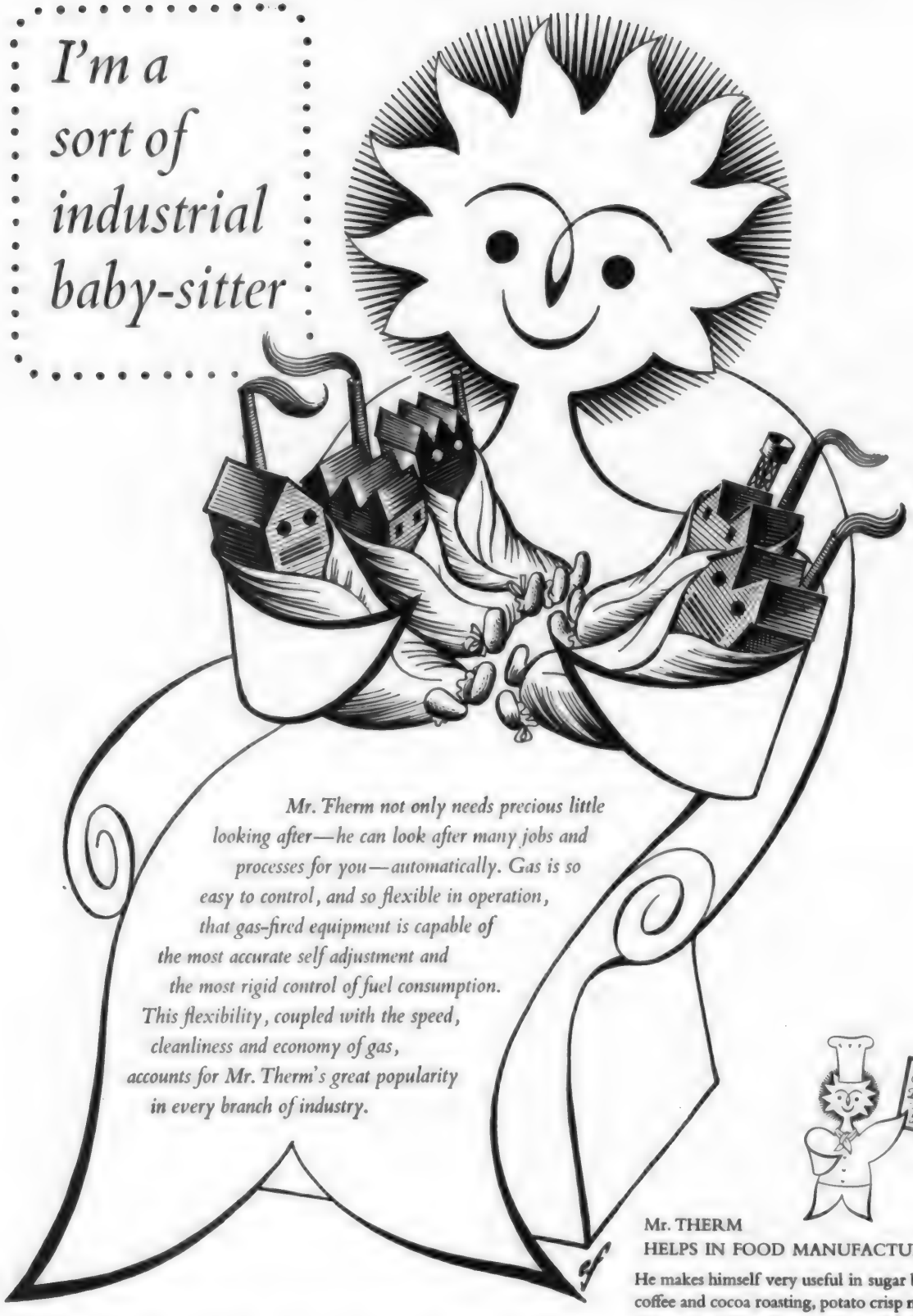
I'm a sort of industrial baby-sitter



Mr. Therm not only needs precious little looking after—he can look after many jobs and processes for you—automatically. Gas is so easy to control, and so flexible in operation, that gas-fired equipment is capable of the most accurate self adjustment and the most rigid control of fuel consumption. This flexibility, coupled with the speed, cleanliness and economy of gas, accounts for Mr. Therm's great popularity in every branch of industry.

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Mr. Therm burns to serve you

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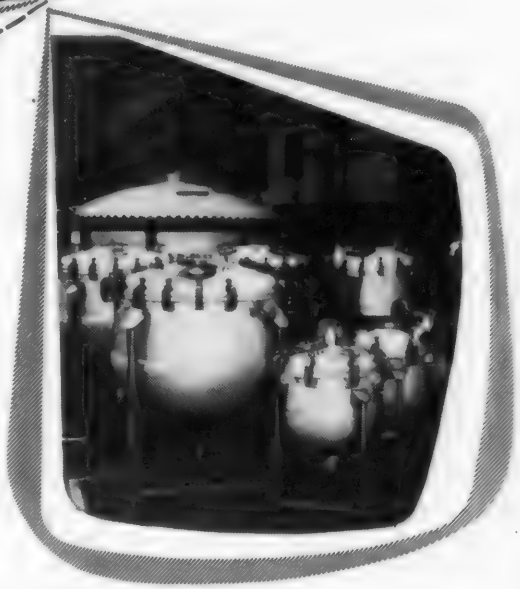
Ronald Albert Smith



APV COPPERSMITH

Ronald Smith is one of the "younger" school of APV Coppersmiths for he has been with the Company only 20 years. He has participated in most of the experimental work that has produced the more recent improvements in stainless steel welding. He was one of the first to use argon arc welding in this country and has seen it pioneered on a commercial scale at the APV works. Such is the importance that APV attach to their tradition of craftsmanship in welding that Smith, who is one of their most skilled coppersmiths, is now mainly employed in training those that are to inherit this tradition.

APV

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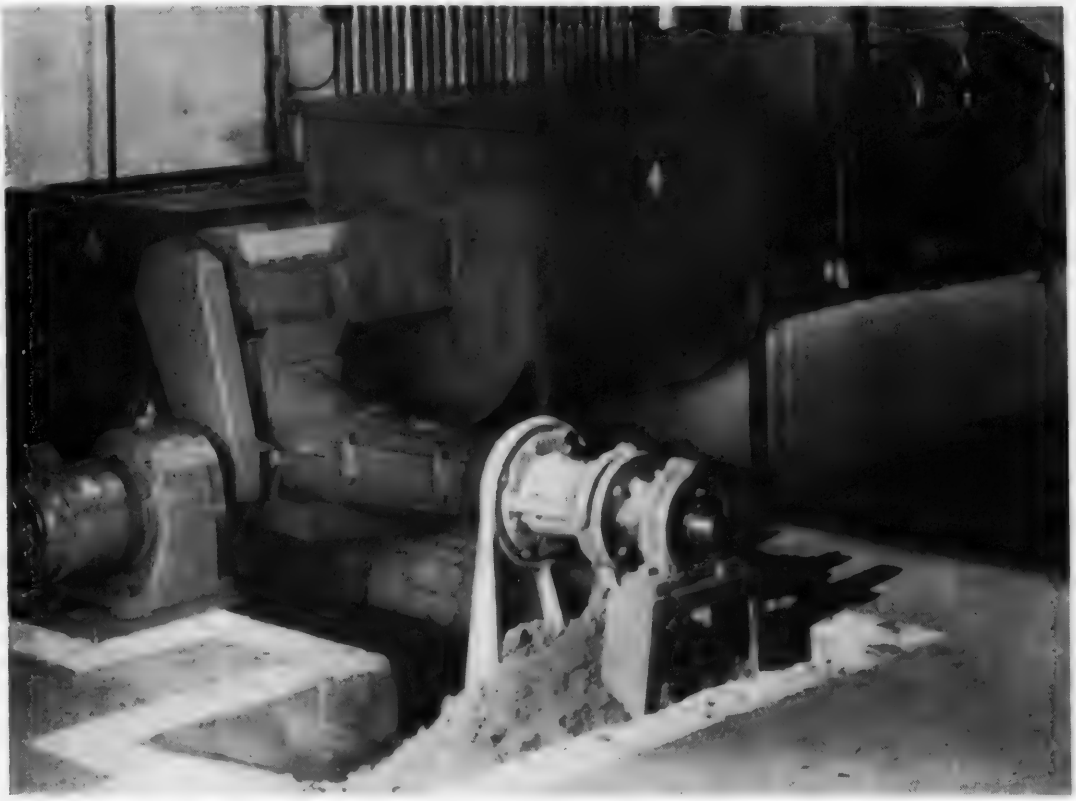

PROTEIN EXTRACTION

For rather more than 10 years, work has been steadily proceeding in developing and perfecting a process, and the necessary plant for the removal of fibre from green crops, thus producing a concentrated extract of protein, carbohydrates and minerals, known by the Registered Trade name of "Protess."

Success has now been attained. The process has many potential applications such as the extraction of protein from fish; of starch from Cassava roots; and the subsequent manufacture of Gari flour; juices from fruit and vegetables, etc. Amongst additional materials treated are grass, clover, lucerne, sugar beet tops, pea haulms, beans (before and after podding), lawn cuttings, nettles, bracken, coarse riverside grass, cuttings from roadside ditches and many others.

The process and plant is covered by World Patents, some of which have already been granted. A prototype has been built and is installed at Heybridge Works, Maldon, Essex. (Illustration shows part of the equipment).

A demonstration can be arranged for any interested food manufacturer.

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WHY FLOORS FAIL 1

The Problem of HEAT

Of all the contributory causes of flooring failure, heat is perhaps the most damaging. High temperature, and subsequent cooling, lead to considerable movements of expansion and contraction which probably act as the starting point of more flooring troubles than all other destructive agents.

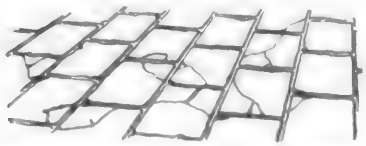
Heat can be transferred to the floor surfacing in two principal ways:

(a) by high atmospheric temperatures and

(b) by contact with hot materials.

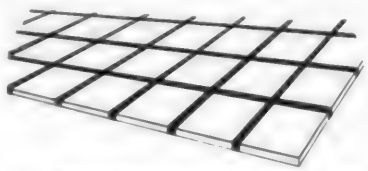
Of these, the latter appears to be the more detrimental, for the change of temperature is more abrupt.

In all forms of food handling, hygiene is of the utmost importance. Consequently, frequent scalding of the floors takes place together with sterilisation of plant and equipment by steam. The temperature of the floor materials is thus raised to high levels. The unequal expansion co-efficients of the surfacings and the sub-floor (added to the fact that the latter responds much less quickly owing to its being partly insulated by the surfacing) set up internal stresses which can only be relieved by the cracking of the surfacing or the forcing of tiles and brick pavings from their base.



"Inflexible bonding material means cracks"

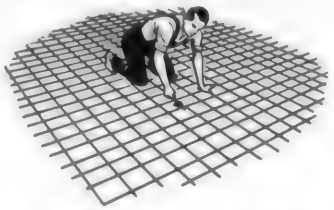
Since the operating conditions must be accepted as an inevitable part of the Food Industry's requirements, the problem must be solved within the floor surfacing itself. Whilst still bearing in mind the need for corrosion and erosion resistance, a bonding material must be sought which will accommodate the stresses set up by the expansion of the tiles and bricks (paved floors are really the only satisfactory form of surfacing for the severe conditions).



"Flexible bonding material accommodates stresses"

It is in the selection of bonding material that specialisation becomes of such significance. With an unrivalled knowledge of the properties of natural rubber latex and of synthetic latices, Semtex Ltd., (A Company of the Dunlop group) is able to put forward bonding agents and jointing compounds which, whilst possessing the necessary chemical qualities, have both great adhesive strength and the essential property of flexibility.

Successful installations in food plants all over Britain provide ample proof of the accuracy of Semtex laboratory development and the skill of their craftsmen. For the same reasons, when you are thinking of installing a new floor, or renewing an old one, you will undoubtedly find it helpful to seek the advice (without obligation, of course) of the Industrial Division of Semtex Limited. Why not drop them a line NOW?



GET YOUR SECRETARY TO CUT THIS OUT AND FILE IT — YOU MAY FIND IT USEFUL

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In addition, the advice and resources of Metal Box are available on all problems related to the use of metal caps and closures. By availing yourself of this service, you as a packer, can be sure of obtaining supplies of finely printed metal caps carrying your brand name as a lasting advertisement for your product. At the same time you can be certain that, with the help of The Metal Box Company's capping service, your product will reach the consumer in perfect condition.

THE METAL BOX CAPPING SERVICE MB

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Water Softener

... saves chemicals - space - time

To ensure value for money from fuel, and low maintenance costs, boilers demand softened feed water. For low pressure boilers the lime-soda process is often best: for lime-soda softening, the "Precipitator" is always best.

The "Precipitator" is the modern lime-soda softener which saves money, chemicals, space and time, and ensures highest boiler efficiency.

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- Combined mixing and reaction time of only 1 hour — saves space.
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- Automatic intermittent sludging provides effective sludge removal — saves maintenance.
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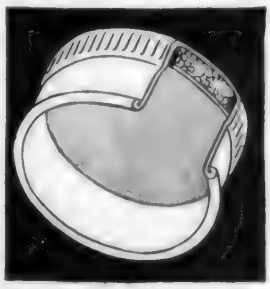
The foresight of the packers in fitting R.O. Seals bears dividends in increased customer satisfaction. This point-of-sale factor is vital to *your* product too. If you use ordinary screw-thread closures, ask yourself these questions—Am I getting 100% hermetic sealing?—Does the closure cause trouble due to variations in the thread of bottles? The R.O. Seal avoids all this by a system of application which literally *rolls on* the cap so that each bottle or jar is individually fitted and hermetically sealed—automatically!
Presentation-conscious manufacturers are getting to know that the R.O. Seal means factory-fresh products in the shops, no returns of leaking bottles from disgusted dealers and a more colourful, attractive closure into the bargain. Why not send for samples and free descriptive brochure?



THE **R.O. seal** *the made-to-measure closure for factory-fresh sealing*

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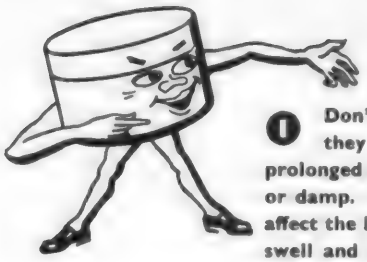
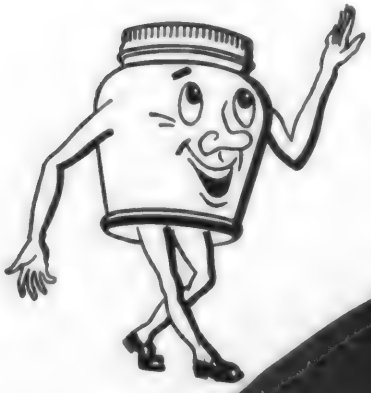
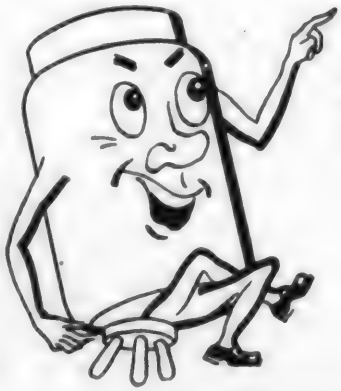


1 Don't store closures where they will be exposed to prolonged heat, excessive dryness or damp. Such conditions often affect the liners, causing them to swell and buckle or to curl and perhaps fall out.



2 The supplier knows what techniques, colours, layouts, work best in production. Let him help you by submitting designs and suggestions.



3 Use the closures in proper rotation. Most suppliers put the date of manufacture on the package.

UGB

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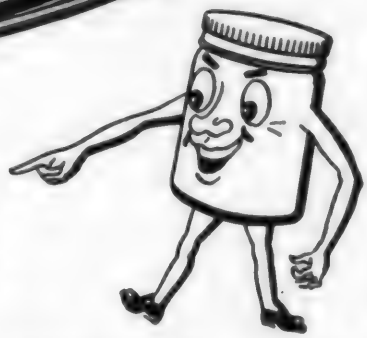
The Perfect Pair



4 When re-ordering, quote the supplier's reference or job number and send a sample when possible, or describe the closure accurately and in detail. This often saves time, thus avoiding rushed work.

UNITED GLASS BOTTLE MANUFACTURERS LTD

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The Air-O-Line System recognizes, analyses and corrects for load changes without cycling, offset, or overshoot. By the employment of a double bellows non-bleed pilot relay and a liquid-filled system, several major advantages are obtained: prevention of flooding, faster response, increased overall system gain and decreased air consumption, more linear and repeatable control settings, increased sensitivity and freedom from vibration—all essential requirements of close process control.

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The Brown Continuous Balance Unit replaces conventional galvanometer and cyclic balancing mechanisms with an amplifier/converter assembly—balancing is direct from input changes themselves. Increased sensitivity and elimination of mechanical lag result in instantaneous response to the slightest temperature variations. In addition, the instrument is free from cyclic action and undisturbed by vibration or position of the installation.

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BRITISH MADE Patent Specification 436,698

The other day we were enthusiastically enumerating to one of our users the many features which distinguish YORK refrigerating plant. How Centriforce lubrication decreases friction and wear on the working parts; how the Balanseal shaft-gland absorbs less power and thus gets more service from every unit of electricity; how Double-trunk pistons increase the useful life of the compressor, and how Pressureflex valves improve the performance, more especially at low temperatures. He listened, and when we had finished, he just smiled tolerantly and said "Yes, old man, no doubt an engineer would agree with all that but as far as I'm concerned

...it all boils down to saving you money

So we've tried to illustrate *his* way of putting it.

If YOU are interested in pictures, by the way, we have some Sound-slide-films on refrigeration, which we'd like to show you. There's no obligation, of course, and we have portable equipment to show it on your own premises without fuss or bother. Just drop us a line and we'll arrange it to suit your convenience.

JUST TO REMIND USERS OF INDUSTRIAL REFRIGERATION THAT WE ALSO MAKE COMMERCIAL EQUIPMENT

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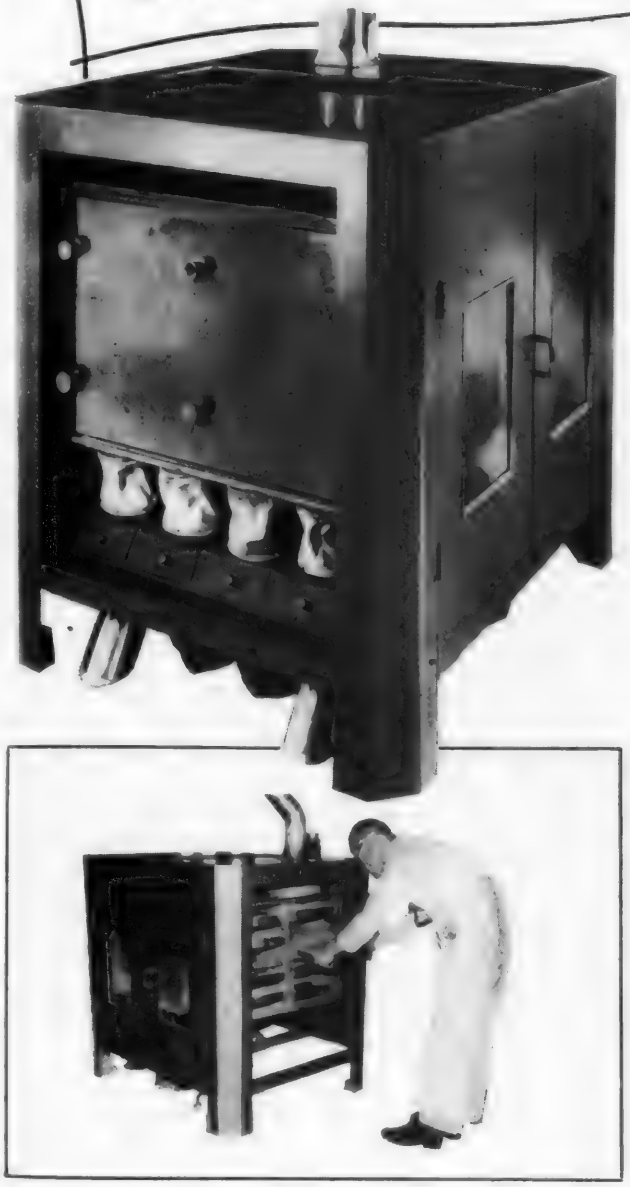

This new machine has a special appeal to industries where

- FLEXIBILITY
- DUST-FREE OPERATION
- SAVING IN FLOOR SPACE
- LOW POWER CONSUMPTION

are of prime importance at throughputs up to 3 tons per hour according to the material treated and the aperture size of the sifting surface. The Junior Sifter is designed to meet the need for a small, flexible, dust-proof and efficient sifting machine for the screening and grading of powdered or finely granulated materials. The machine is totally enclosed, and sieve trays can be arranged in any one of three different schemes in order to make different separations. A ¼ h.p. motor supplies the power.

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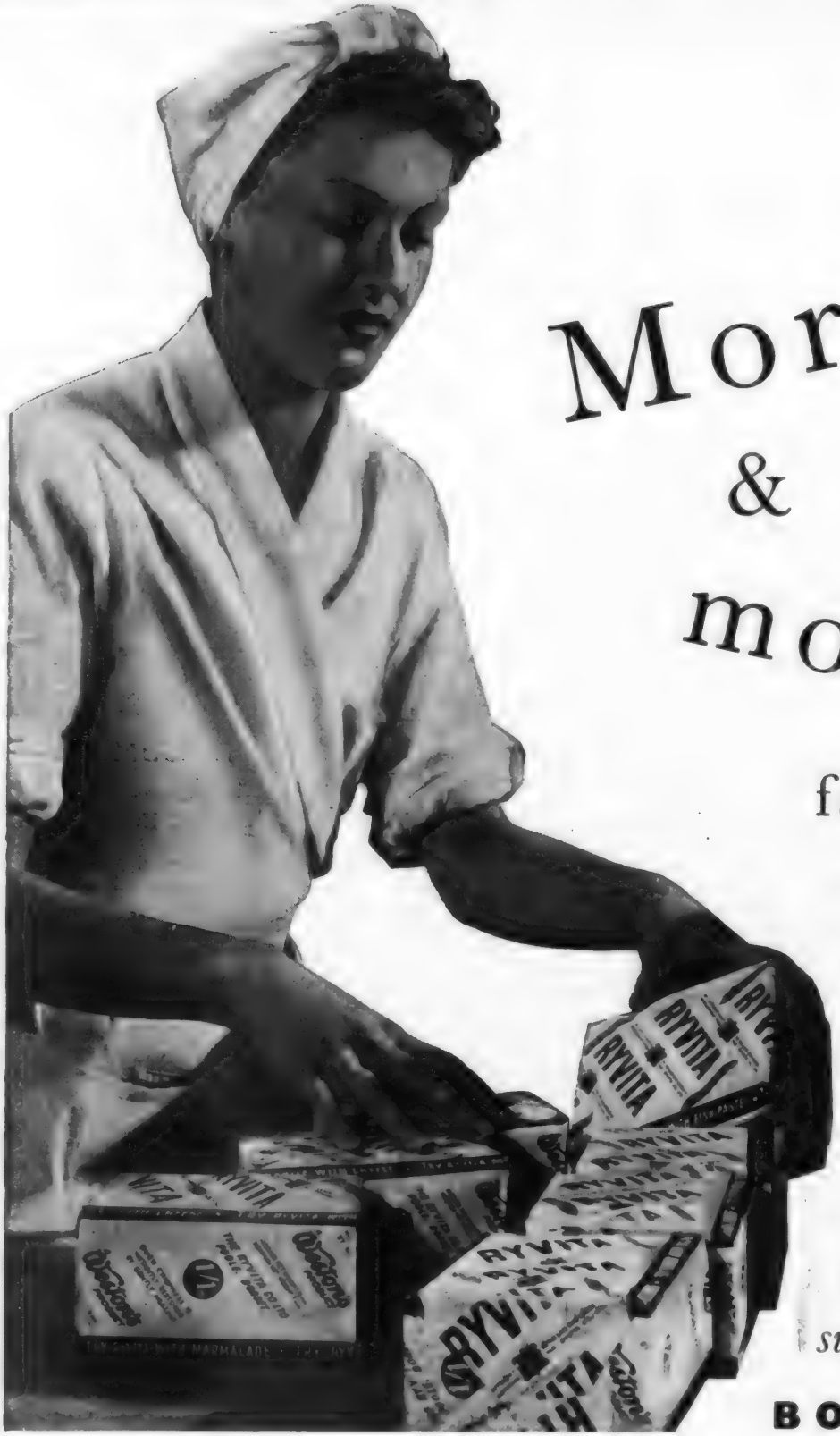

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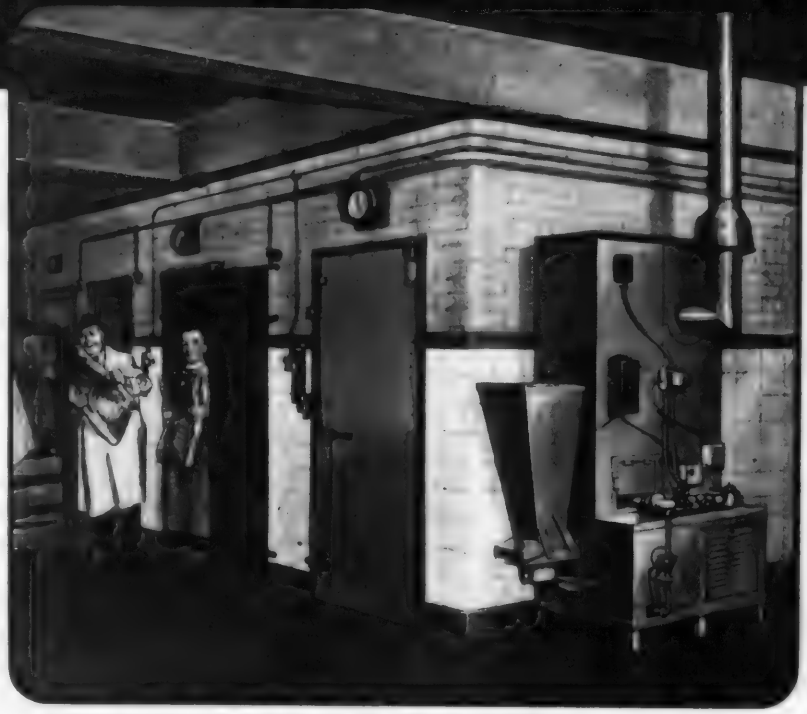

The "Smoke-Tender" Unit generates both smoke and heat outside smokehouse. No fire comes in direct contact with air going into smokehouse. Positive air circulation with inlet and return ducts, and ¼-h.p. blower. Air heated indirectly by main gas burner rated 125,000 B.t.u. hourly input. Sawdust charred by separate burner rated 20,000 B.t.u. hourly input. Fumes from both burners are vented, and do not enter smokehouse. Automatic safety pilots on both burners.

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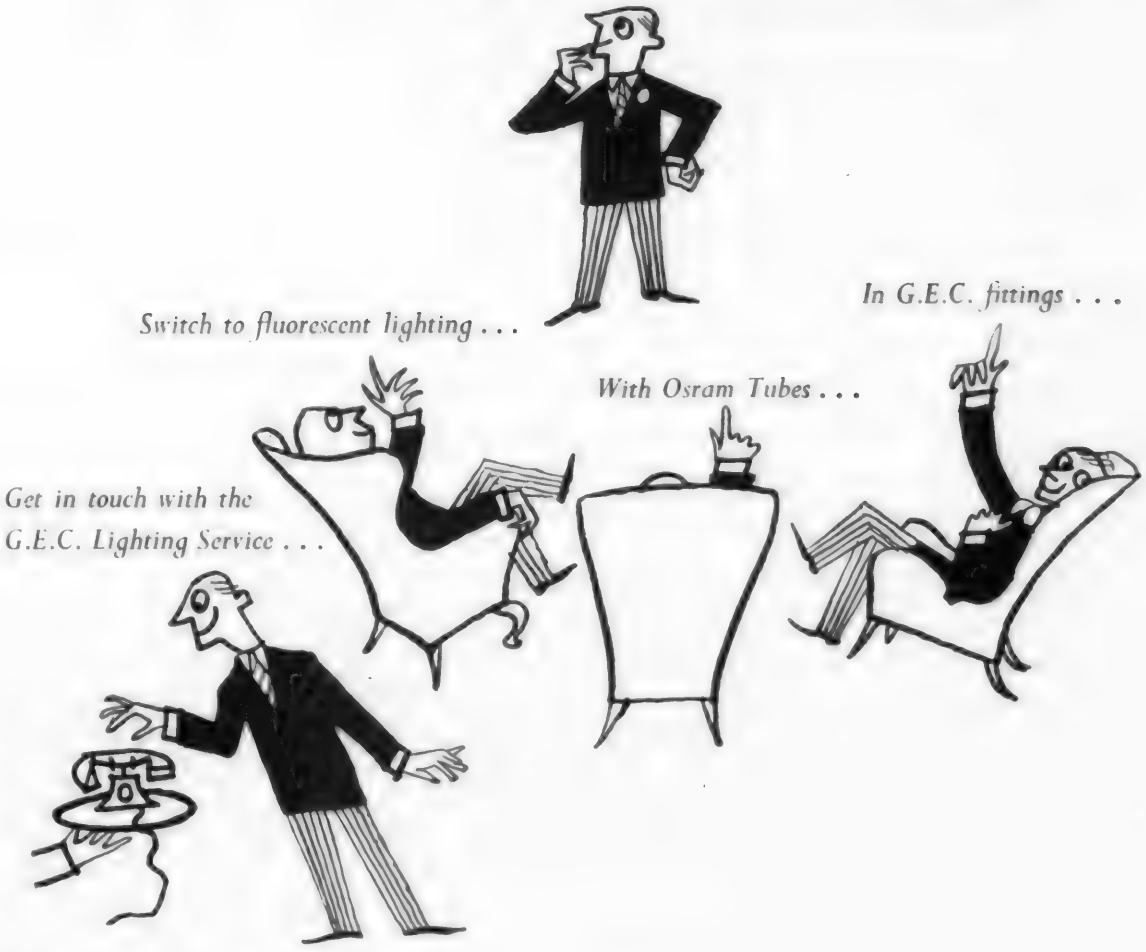

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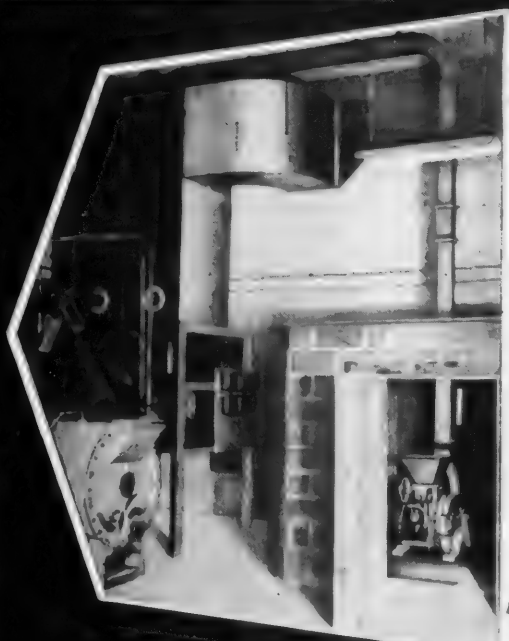
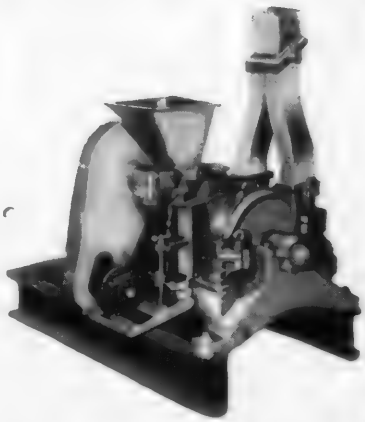


Left: Typical installation of No. 6 MIKRO-ATOMISER *and* MIKRO-COLLECTOR *in large chemical plant.*



Right: No 6 MIKRO-ATOMISER

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* SAVINGS IN POWER
* IMPROVED FINISHED PRODUCTS
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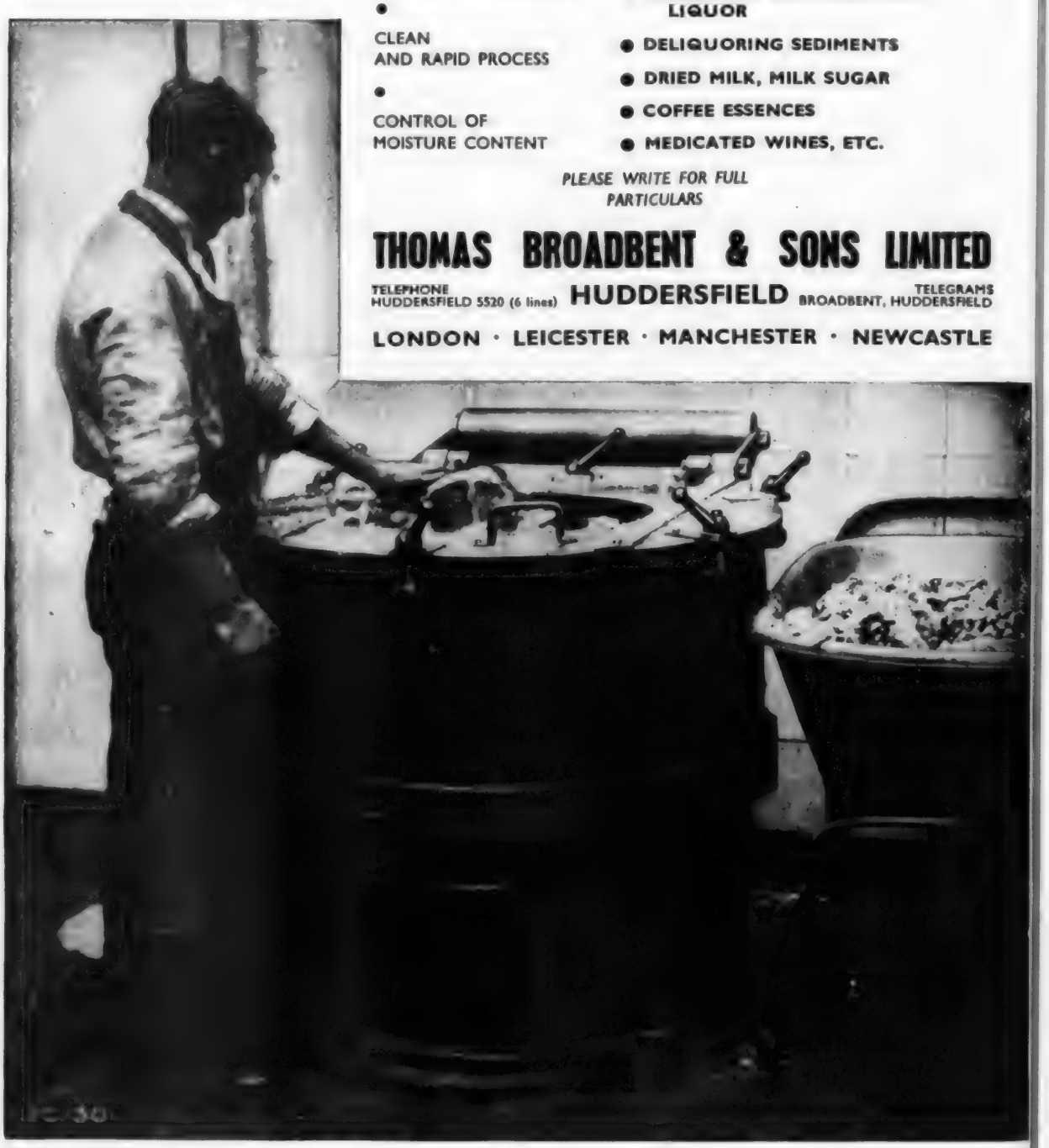
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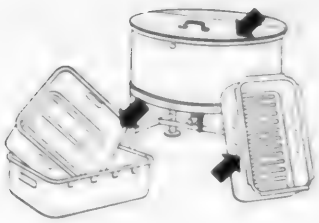

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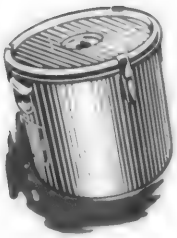

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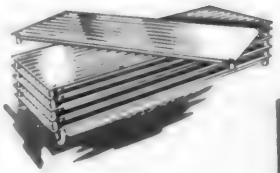

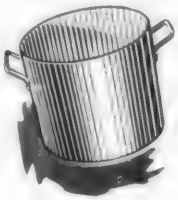

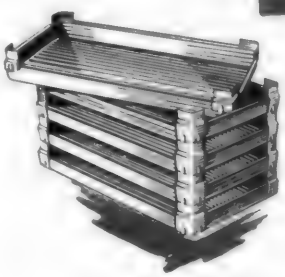

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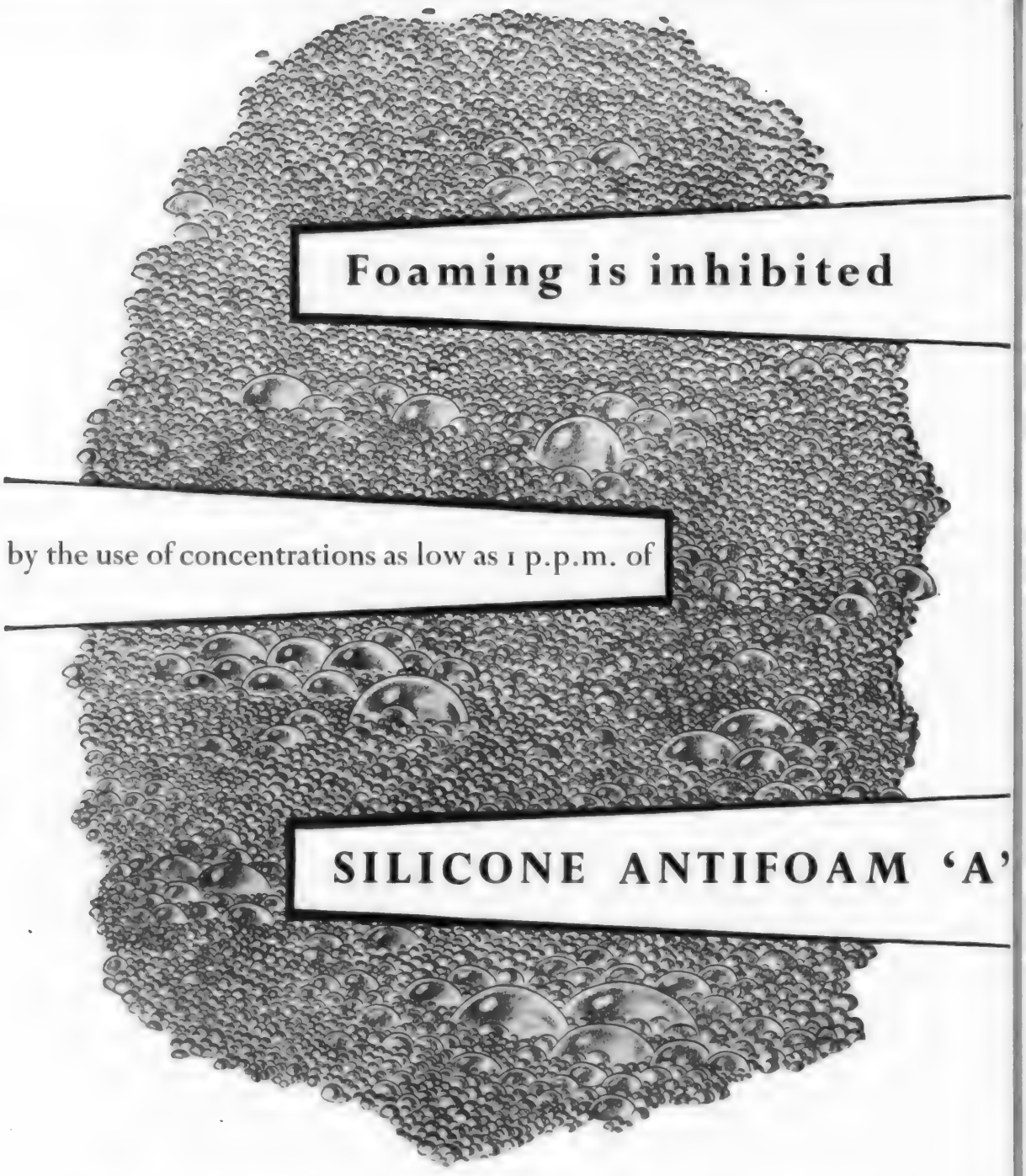

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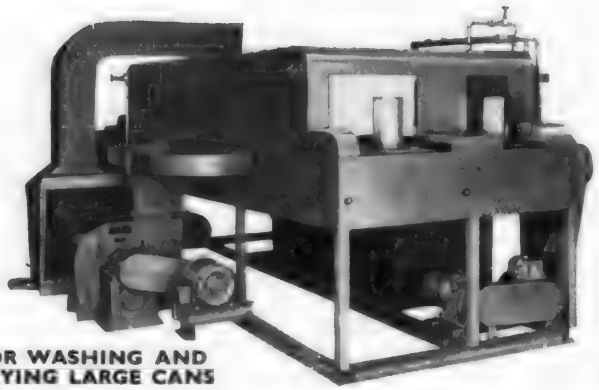

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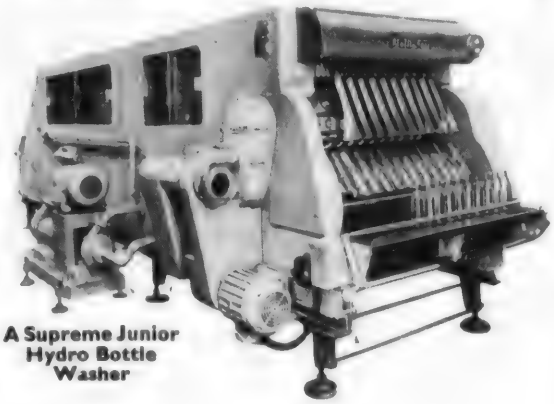

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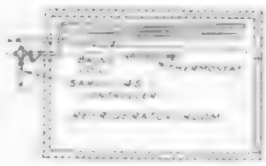

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Sarco Temperature Controllers give fully effective (direct-acting) operation at refrigeration temperatures.

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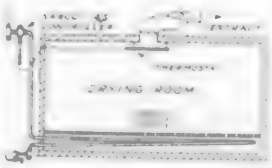
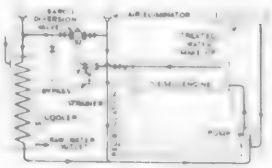
Sarco Controllers for regulating temperature in hot water storage and non-storage calorifiers.



FOOD DRYING ROOMS

Sarco Controllers for regulating steam or hot-water supplies to food drying rooms, etc.



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SARCO CONTROL

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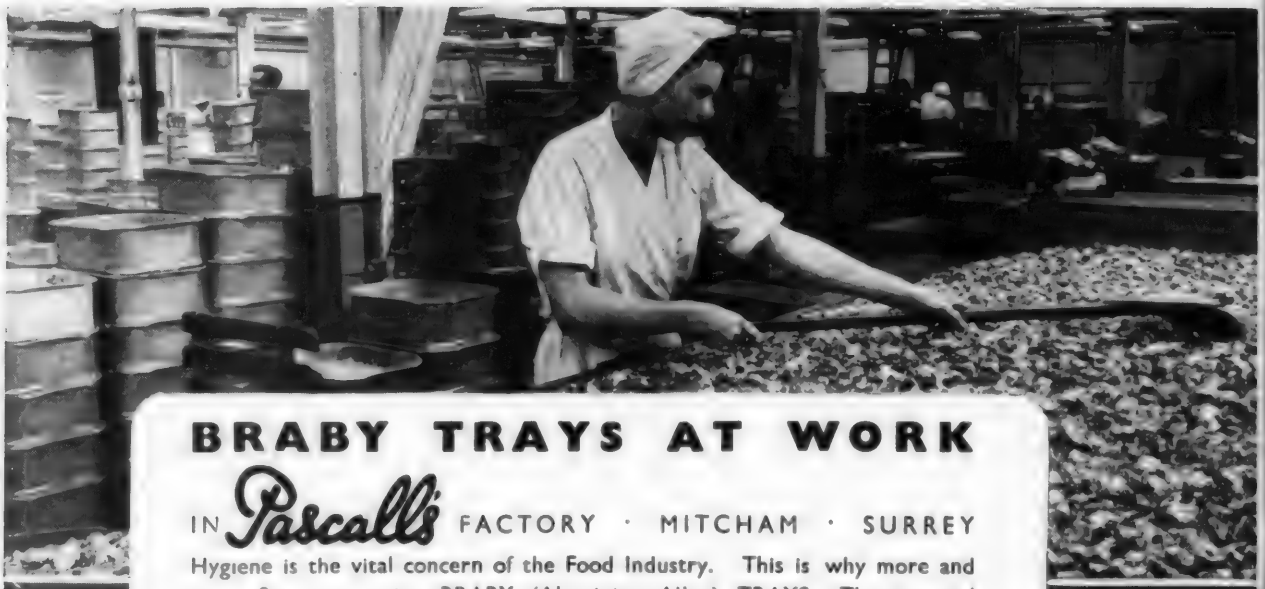

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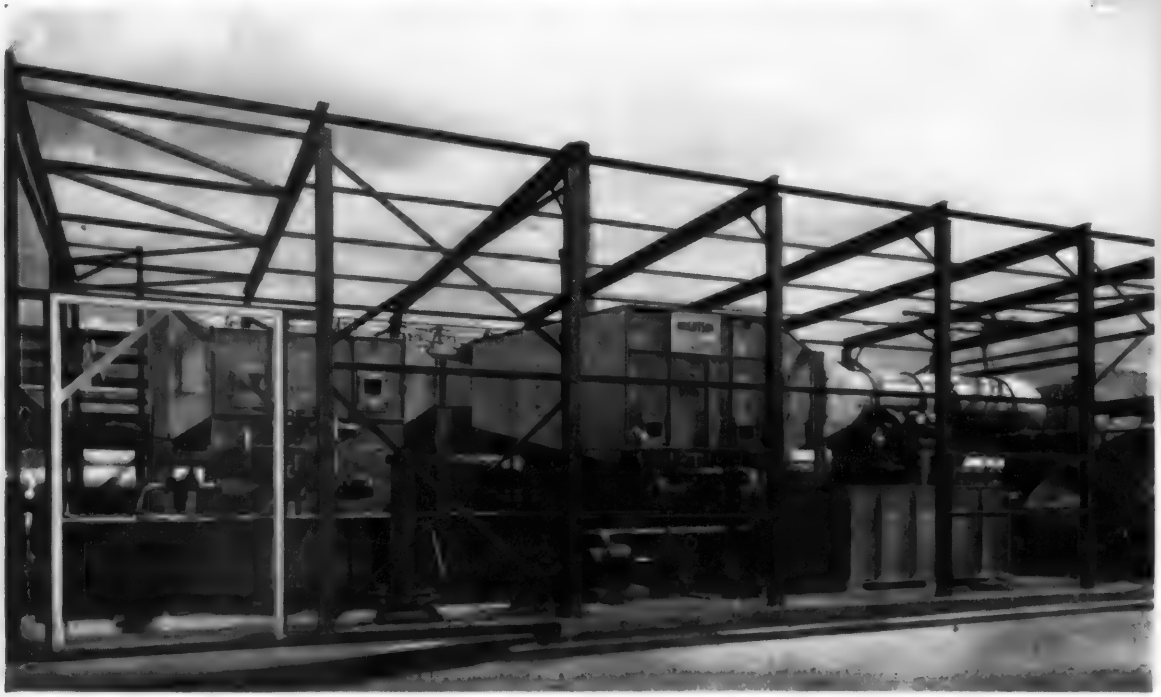

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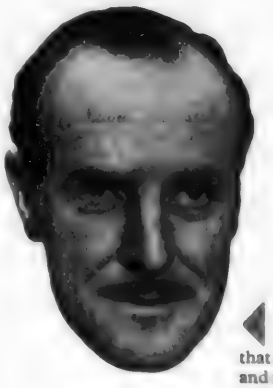

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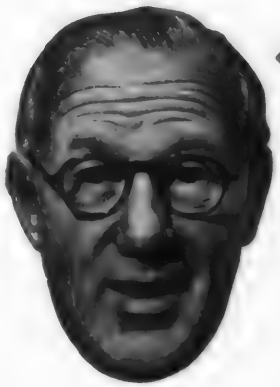

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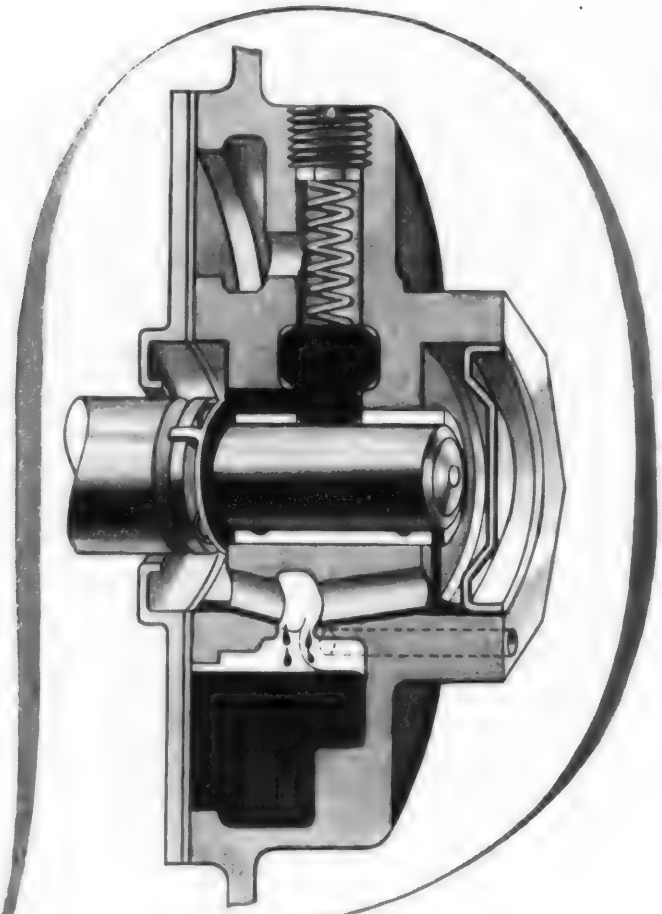

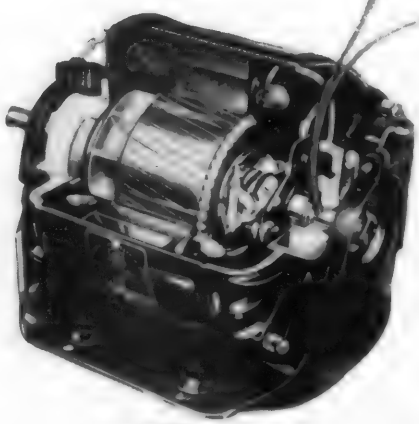

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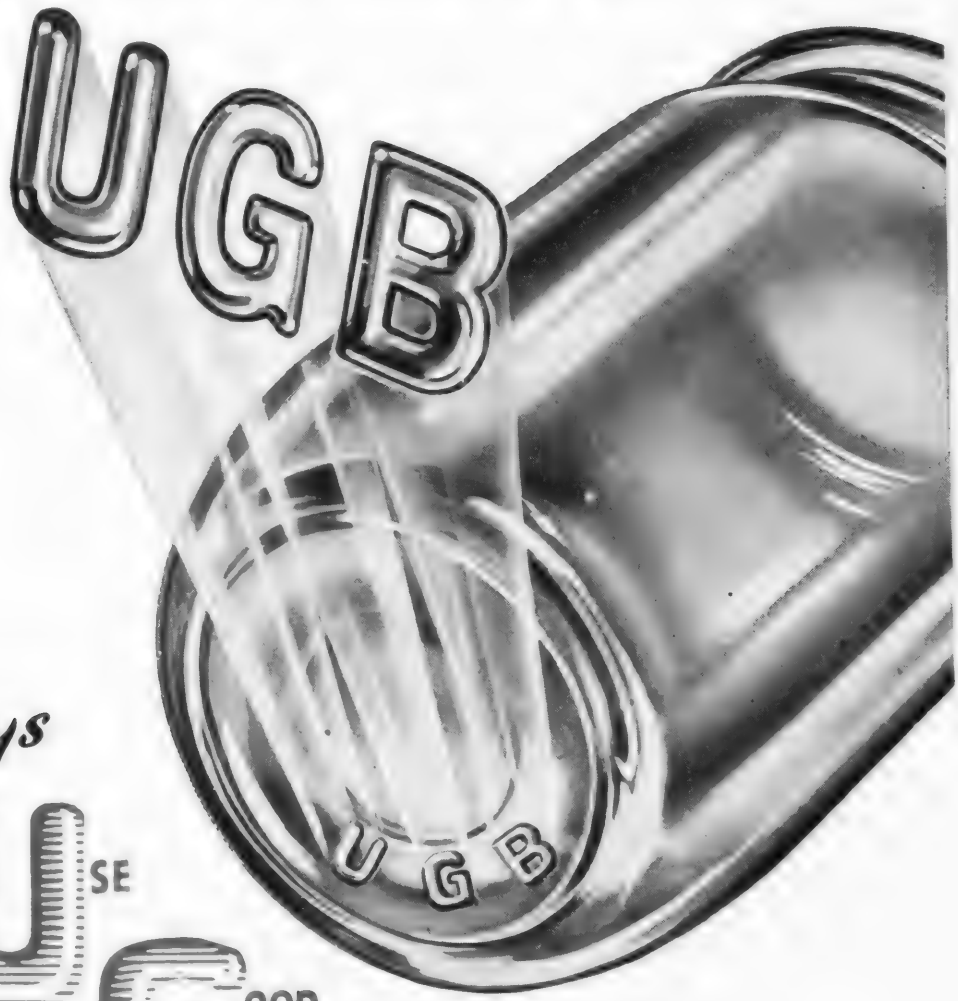

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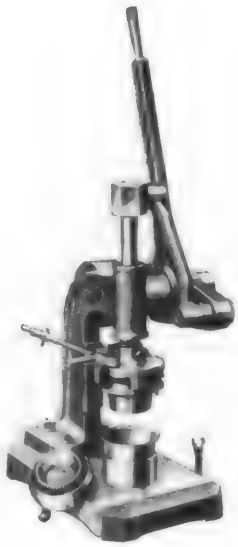

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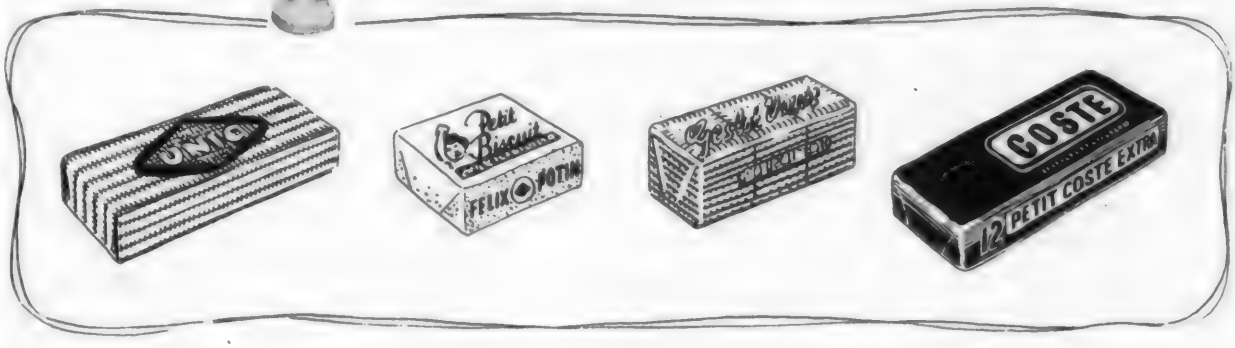

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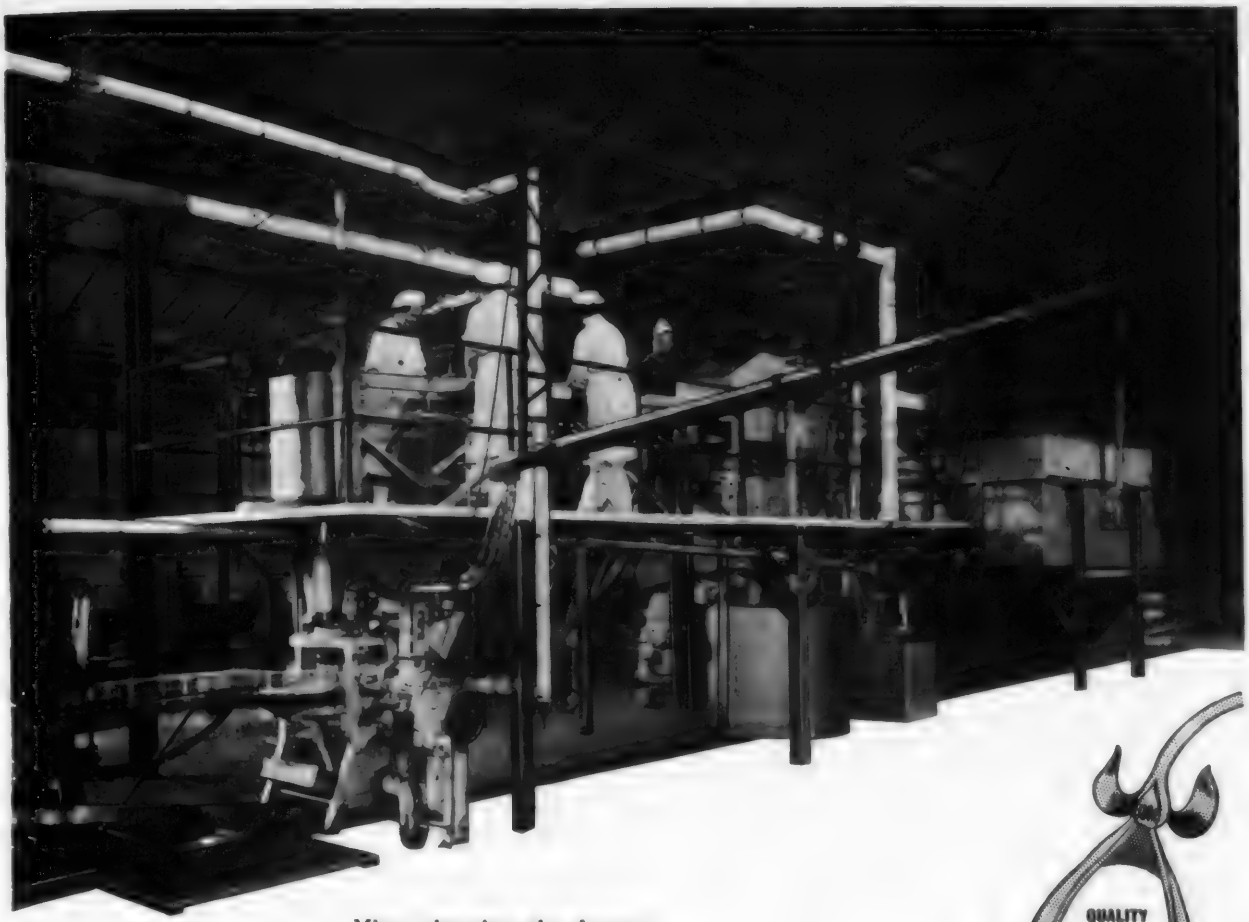

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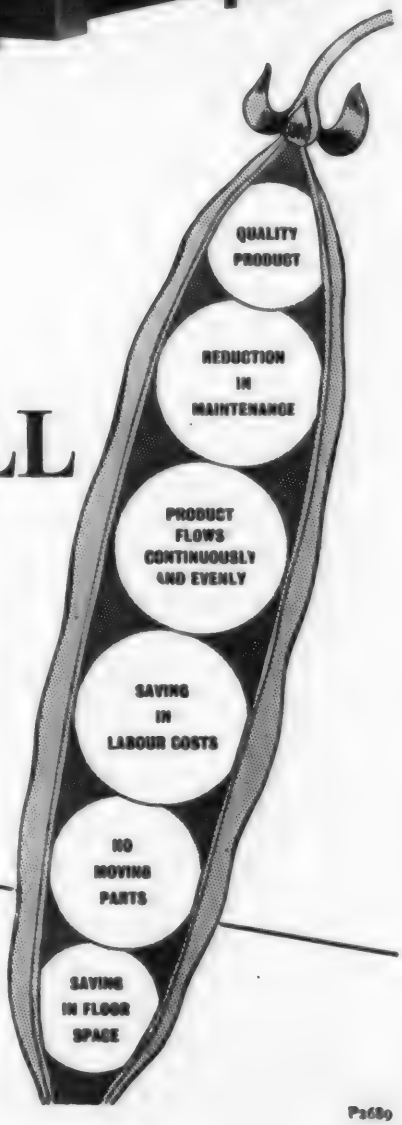

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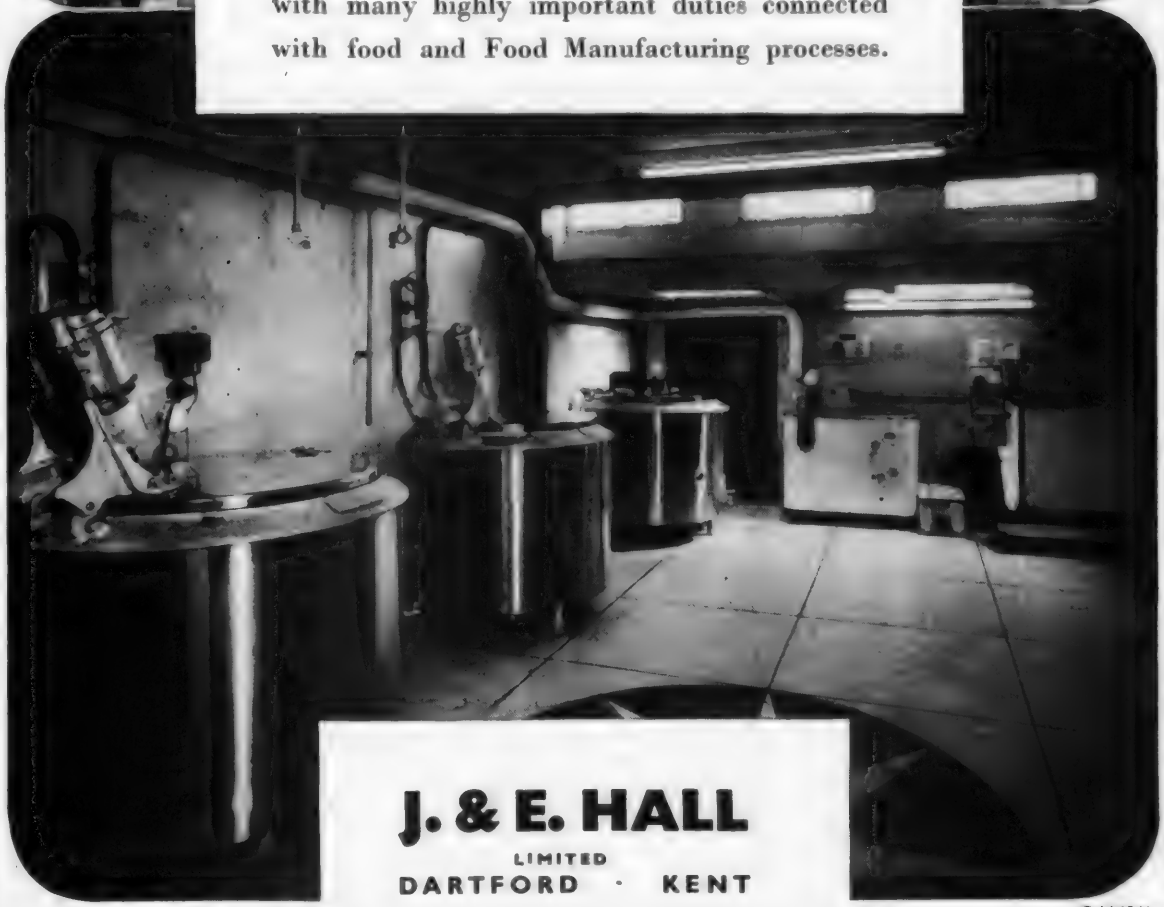

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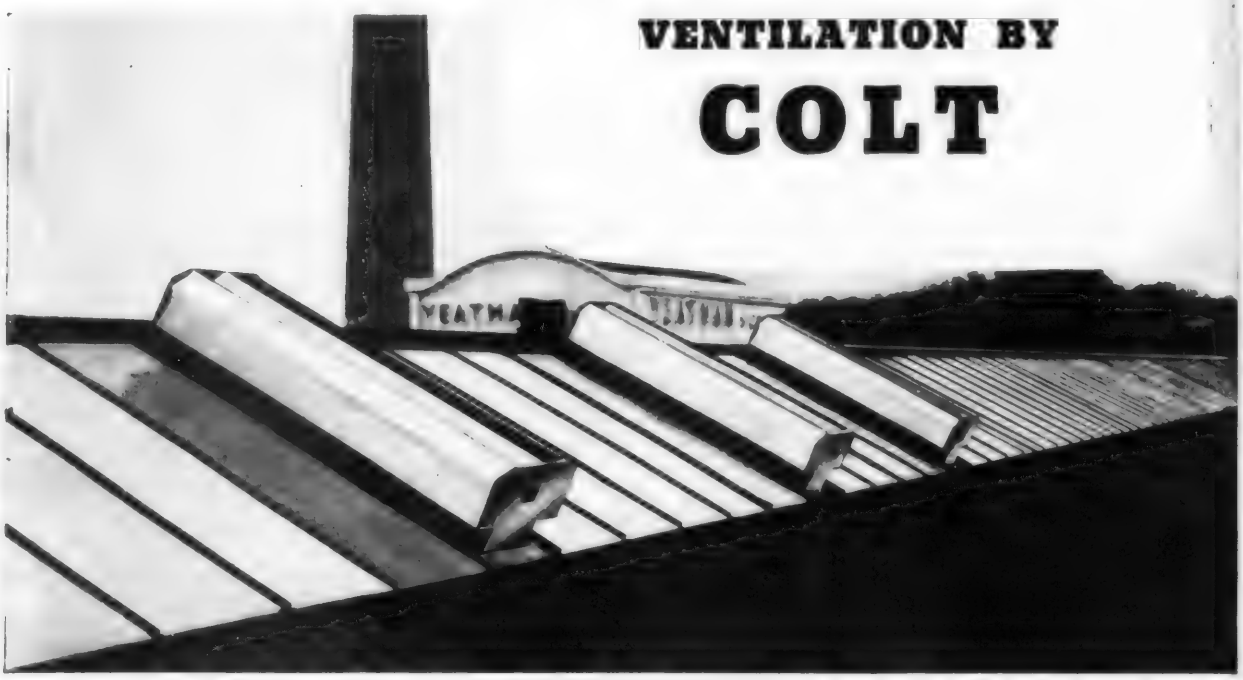

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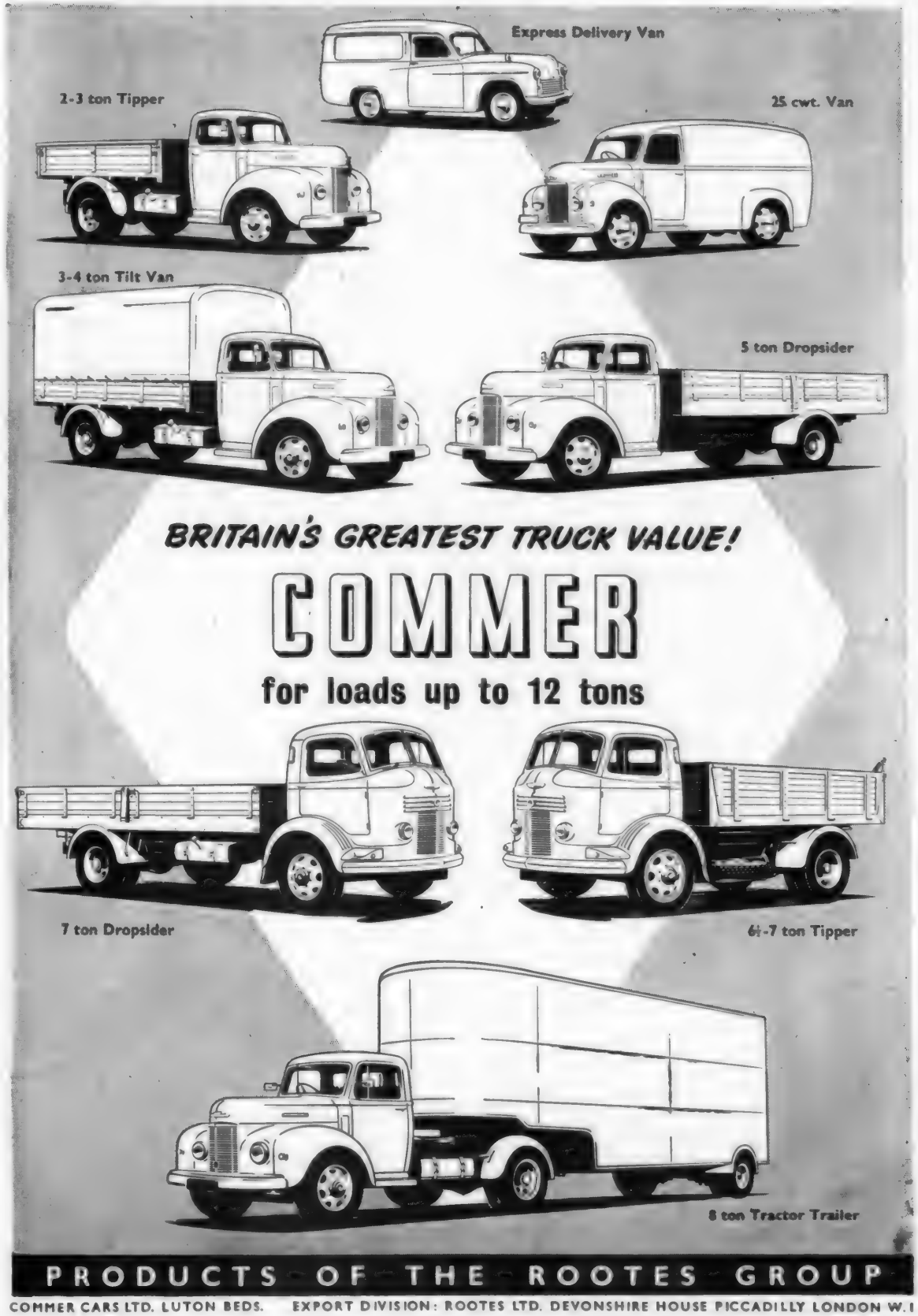

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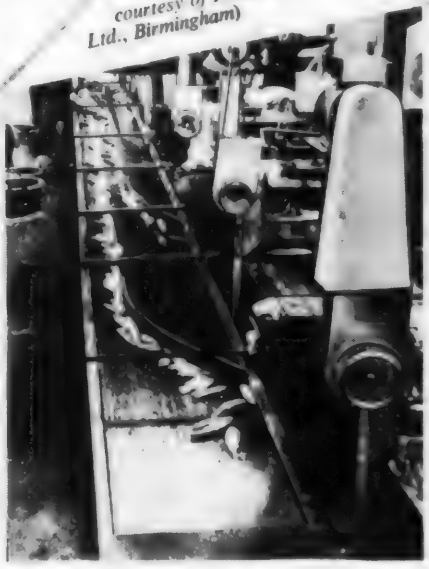
Fruit bottling on a 'Motoveyor' conveyor (by courtesy of J. Mawdsley Ltd., Wigan)



Scandura conveyor in a fish canning factory (by courtesy of Fisher & Ludlow Ltd., Birmingham)

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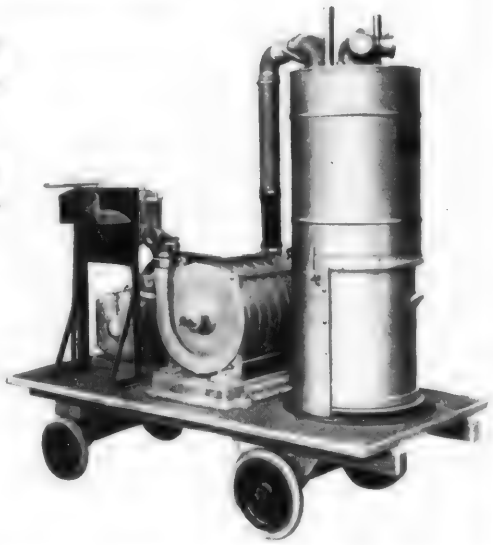

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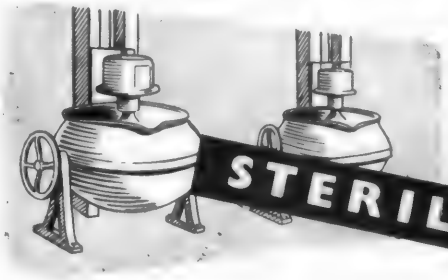

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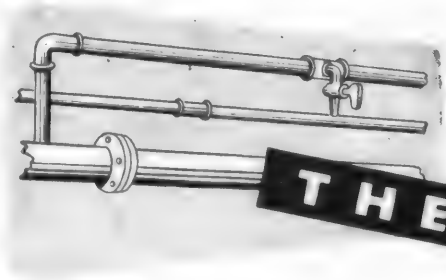

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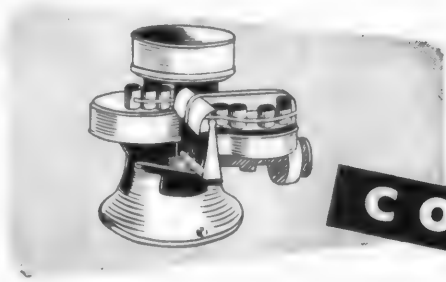

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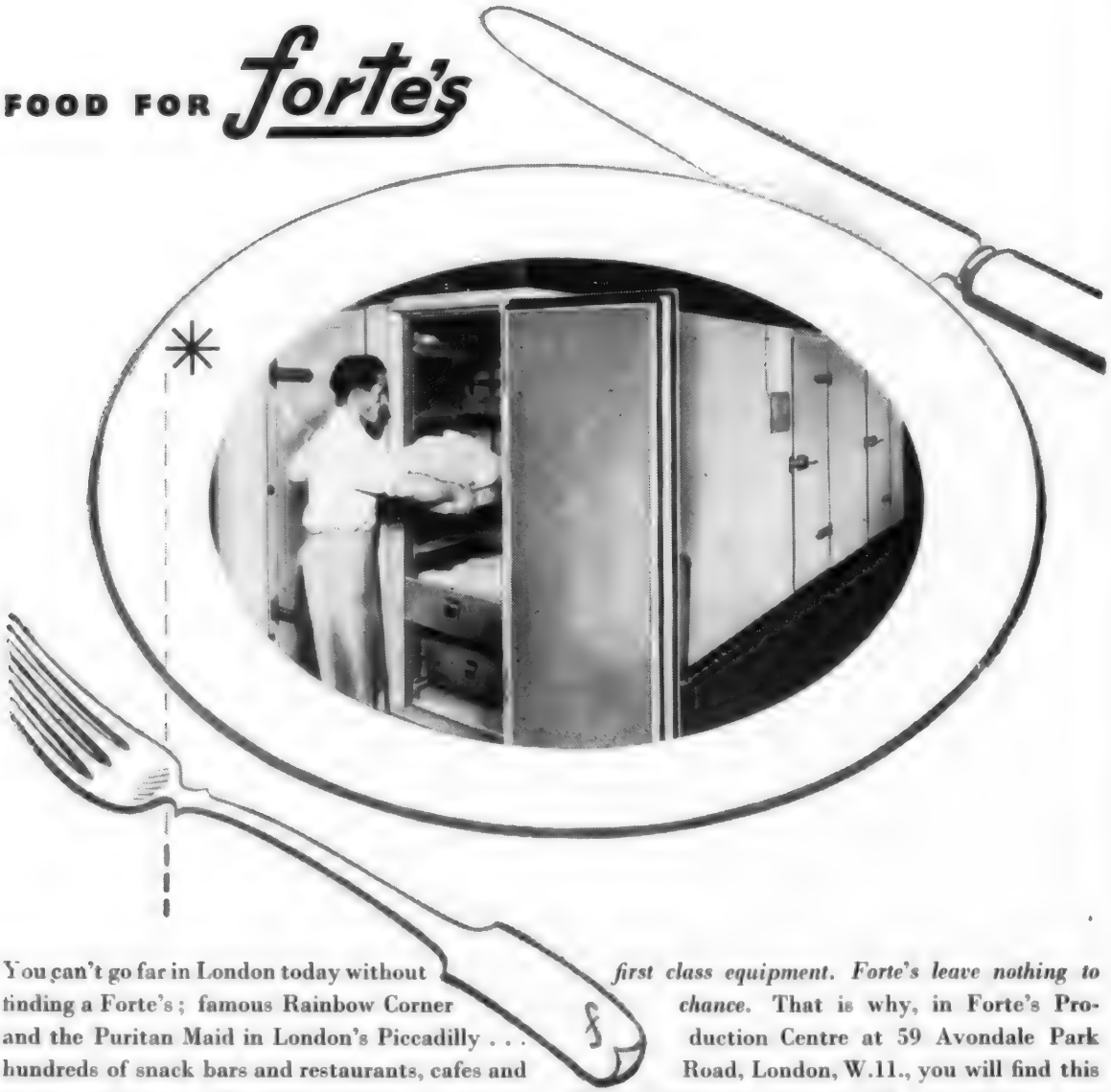

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FOOD MANUFACTURE

Vol. XXVIII. No. 1 · Published Monthly · January 1, 1953

CONTENTS

	Page
Editorial	1
Sausage and Small Goods Manufacture	5
New Laboratory for Fish Research	9
World Trade in Meat	10
The Chemistry and Physics of Macaroni Products. Part VI. *J. A. Radley, M.Sc., F.R.I.C.*	11
Correspondence	17
Protein Extraction from Green Crops	19
Fats and New Zealand's Economy. *F. B. Shorland, M.Sc.(N.Z.), Ph.D.(Liv.), D.Sc.(Liv.), F.R.S.(N.Z.)*	21
The Milling Industry. *A. J. Amos, Ph.D., B.Sc., F.R.I.C.*	27
Trade News	33
Information and Advice	41
Recent Patents, Trade Marks, and New Companies	42

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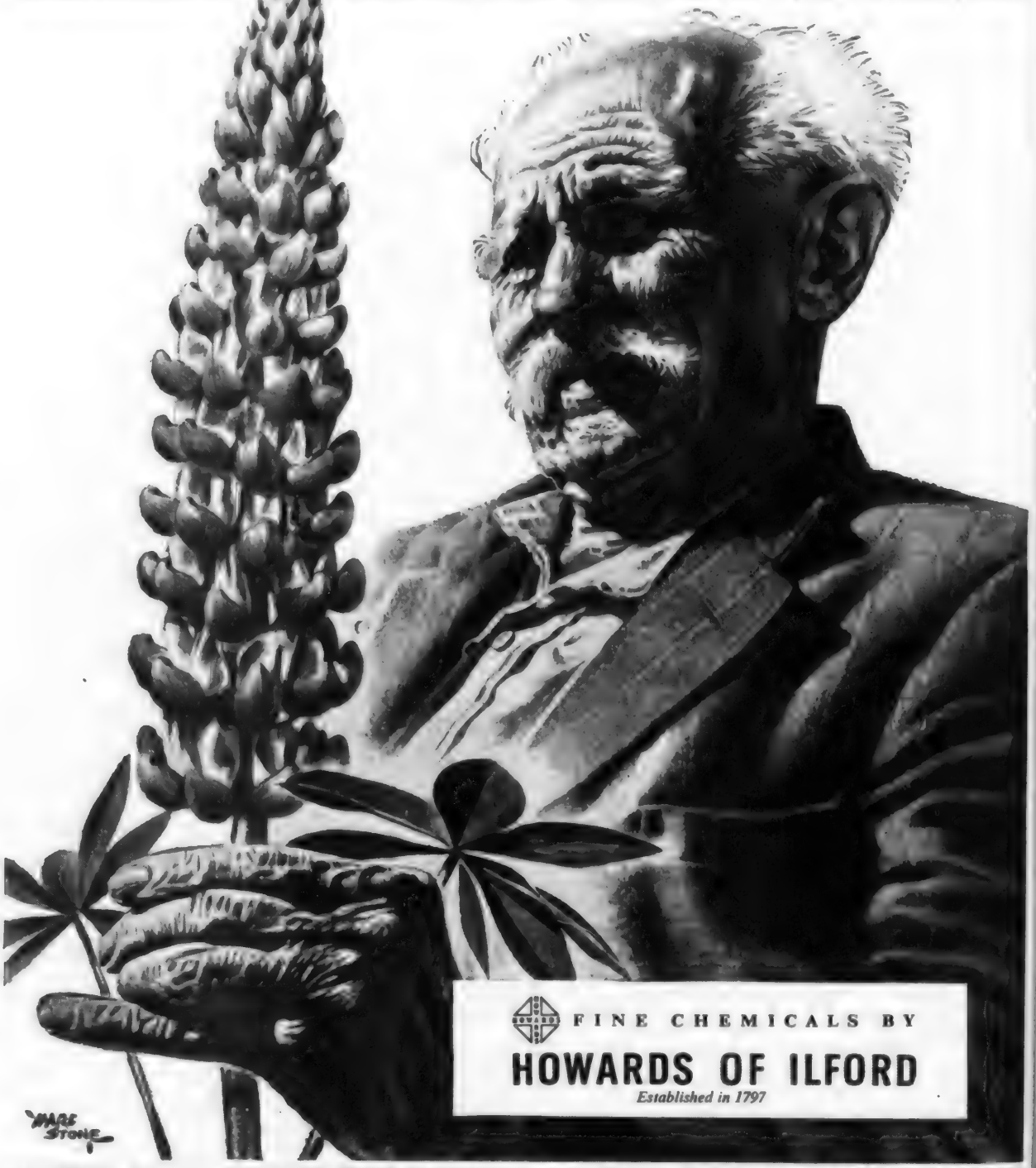
'If you would see my monument look around you'. That is a proud epitaph indeed, and it might stand in any modern garden to mark the achievement of George Russell. For this great lover of flowers and wisely simple countryman has enriched the herbaceous border with the glorious Russell Lupins. With green and loving fingers he coaxed out of the plain blue flower a flood of hybrids that have left gardeners for ever in his debt. *Achievement in our time* comes only as it always came—by mastery of technique based on knowledge and devotion. It is our conviction that this can also mark the attitude of a chemical house on which the health of men and the progress of industry depend.



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FOOD MANUFACTURE

Vol. XXVIII, No. 1 January 1, 1953

January 1953

AS we prognosticated in our message of last year, there have been no dramatic improvements in the food situation during 1952; most of the old problems, and some new ones, still confront the industry. This is not the place to review these matters as they are fully discussed in the Progress Reports published annually in FOOD MANUFACTURE.

Looking ahead, one problem among the many which will have to be tackled sooner or later is the total derationing of food—a subject that is already being hotly debated in business circles, as would be expected seven years after the end of the war. Its persistence is part of a vicious circle involving difficulties of dollar exports which, in their turn, may be traced to the influence of food subsidies and the resulting inflationary pressure.

It would be temerarious to attempt to make prophecies of any kind about 1953. Yet, illogical as it may be, it is impossible to escape the feeling, albeit an evanescent one, of exhilaration, of hope, as we pass into the New Year. But it is necessary for realism to break in. In the words of that wise statesman General Smuts, "it is the realist and not the idealist who is generally justified by events. We forget that the human spirit, the spirit of goodness and truth in the world, is still only an infant, crying in the night, and that the struggle with darkness is as yet mostly an unequal one."

Science and the Fishing Industry

AT the opening of the Humber laboratory, a description of which is published elsewhere in this issue, Sir Ben Lockspeiser, secretary of the Department of Scientific and Industrial Research, gave some interesting statistics about fish. It was rather surprising, he said, that although we were consuming substantially less meat per day than before the war, we were not consuming more fish. In 1950, we consumed about 16 per cent. less and in 1951 about eight per cent. The kipper especially showed a decline, its consumption in 1950 and 1951 being in the region of half of what it was in 1947 and 1948.

To ensure fish reaching the consumer in good condition was no easy task, and to enable science to lend a hand in it, the new laboratory had been installed on the Humber, where were situated two of the largest white fishing ports in Britain which specialised in fishing distant waters.

The Humber laboratory, said Sir Ben, was not a new venture as workers from Torry had, during the past four years, been working on the problems of improving the average freshness of distant water fish; it was part of a continuous process of development.

A part of the work, devoted to more study of the composition of fish, might appear rather academic, but it had nevertheless a practical bearing on the problems facing the producer and distributor. For example, the fact that herring increased in fat content from two to 20 per cent. in the course of about six weeks in the summer had an important bearing on quality for processing, especially for smoking. Again, it was known that its freshness was affected by the numbers and types of bacteria in the fish and by the presence of small amounts of certain minor constituents of its flesh. There was also the need to find a reliable test of freshness that would be simple to apply in the laboratory and in industry. This would remove the dependence on personal opinion, which, however experienced, was apt to be variable.

Industrial science, continued Sir Ben, was a joint enterprise between industry and science. It was good to know that the Hull Fish Merchants' Association had already set up an informal panel to discuss the problems of fish distribution with the staff of the laboratory, and that the results of the work on board distant water trawlers had also been discussed with the catching section of the industry.

Following these discussions, the White Fish Authority, in consultation with the D.S.I.R., were setting up on a national basis a small informal technical committee, comprising experts from the trawling, shipbuilding, refrigerating, and other appropriate industries, to keep under review the results of research and its application, with the object of improving the preservation of white fish at sea.

This was all to the good, as it would help to further the use made of science and to promote its co-operation with the fishing industry.

THE EDITOR SENDS SEASONAL GREETINGS TO ALL READERS

Amino Acids in Coffee

PREVIOUS studies by G. E. Underwood and F. E. Deatherage of the Institute of Nutrition and Food Technology, Ohio State University, indicated that a large proportion of the nitrogen in the coffee seed or "bean" was present as amino acids, combined in the form of proteins or other compounds.

The authors believed that a study of the amino acids present in the raw and roasted beans might shed some light on the changes that take place in the roasting process. The result of this study was presented in a paper read at the twelfth annual meeting of the Institute of Food Technologists.

In all, 14 amino acids were identified in hydrolysates of green Santos coffee beans. By use of ion exchange chromatography, nine of these amino acids were estimated quantitatively in hydrolysates prepared from the green and roasted coffee, and in those prepared from aqueous extracts of raw and roasted coffee beans. All the amino acids determined were found to be present in the green and roasted beans in comparable amounts. There was an appreciable amount of amino acid containing compounds present in the aqueous extract of the roasted coffee.

A new method of protein hydrolysis, using an ion exchange resin, was found to give almost complete hydrolysis of casein and of the water soluble coffee proteins. The resin used was Dowex 50, a sulphonated polystyrene resin; the hydrolysis was accomplished by mixing the protein, water, and the hydrogen form of the resin, and then refluxing the mixture.

Food Tasting Studies

AS the selection by taste of any particular food can vary from person to person, it is only by studying statistically the ability to taste of a sufficiently large group of people that trends in preference can be detected.

In a recent paper (*J. of the Science of Food and Agriculture*, **3**, 10, 433) J. B. M. Coppock, J. H. Hulse, J. P. Todd, and A. Urie have described investigations made with a view to assessing the general ability of a large and heterogeneous population representative of both sexes to differentiate by tasting between different qualities of bakery products. Another object of the studies was to investigate the general preference of the population for different qualities of shortbread, cake, and bread.

For shortbread, there was a significant ability to differentiate between the products containing butter and cake margarine. When 80 per cent. extraction flour was replaced by 72 per cent. extraction (white) flour in cake, there was an increase in ability to differentiate between products containing cake margarine plus dried egg and those containing butter plus fresh eggs.

After it had been demonstrated that the group possessed powers of discrimination, a consumer-preference study was made on breads prepared from flours of different extraction rates. The results showed that (1) by taste, breads prepared from 72 and 80 per cent. extraction flours were almost equally preferred, whereas bread made from 82½ and 85 per cent. extraction flours were considerably less preferred, in that order, and (2) by appearance, breads prepared from 72 per cent. extraction flour were preferred to all other kinds examined.

Similar studies were made on preferences for shortenings of various types in shortbread, the order obtained being (1) butter, (2) compound cooking fat, and (3) cake margarine.

It was evident that persons possessing a significant ability to taste showed a marked preference for products of high quality. There was no evidence to show that smokers and persons possessing dentures were appreciably inferior in their ability to taste.

Sweetening Power of Sugars

IN the absence of any physical instrument for measuring the sweetness of sugars, the subjective reaction of human beings during tasting must be relied on. Apart from their sweetness, individual sugars exhibit other characteristic tastes which are bound to complicate the task of the taster. Another formidable difficulty in the evaluation process is that each taster must compare the intensity of a given stimulus with the recollection of the intensity of a preceding stimulus. It is therefore not surprising to find conflicts of opinion among different workers.

Some recent data for the relative sweetening powers of dextrose and starch syrup, compared with sucrose, at various concentrations by Turnbow, Tracy, and Raffetto ("The Ice Cream Industry," Second Edition) thus appear to diverge slightly from those of earlier workers, judging by a tabulated survey compiled by Cameron ("The Taste Sense and the Relative Sweetness of Sugars and Other Sweet Substances").

The results in question were obtained when using solutions of single sugars and not of mixtures, whereas in the food industries it is usual to make use of mixtures, the most common being sucrose/starch syrup or sucrose/dextrose. Other types of taste-imparting agents will also normally be present, as in ice creams, liqueurs, toffees, and jams. This last factor has prompted Roederer (*Gordian*, September 10) to institute some tests of the relative sweetness of mixtures of sucrose with (*a*) dextrose, (*b*) starch syrup (normally and highly converted), and starch sugar. The standard for comparison was a refined sugar in a concentration of 20 g. per 100 ml.

At the outset 25 per cent. of the refined sugar (5 g. per 100 ml.) was replaced by various amounts of

syrup or dextrose, and an evaluation was performed (by tasting 1 ml. of each solution) of the amount of sugar or syrup that was equivalent in sweetness to 5 g. of refined sugar. From the resultant figures the relative sweetness was calculated as a percentage by dividing the replaced amount of refined sugar by the added amount of the other component and multiplying by 100.

The mean values obtained in tests with seven people on different days were, in terms of relative sweetness: sucrose 100, dextrose 70, starch sugar 60, starch syrup (53% dextrose equivalent) 60, and starch syrup (42% dextrose equivalent) 50 per cent.

In order to establish whether the same relative sweetness is found when using different mixing ratios, further tests were made in which 50 per cent. of the refined sugar was replaced by one of the other components. The results were the same as above except in the case of dextrose, which was 75 per cent., starch syrup (42% dextrose equivalent) 55 per cent. relative sweetness. The figures for starch sugar were not given.

The author states that these figures are an accurate reflection of observations on the commercial production scale. A check on their accuracy was also performed by running similar evaluation trials on jams and ice creams with various contents of starch syrup.

New Zealand's Food

NEW ZEALAND'S contribution to the maintenance of world food supplies—she exports more food per head of her population than any other country—grows in importance every year.

Long-term agreements have provided New Zealand farmers with assured sales, but there have been signs in the rising world prices of recent years that the relatively stable prices of these agreements have caused heartburning among the farmers. According to a Wellington correspondent to *The Financial Times*, it was only the windfall from swollen wool prices that checked a strong tendency for both the Government and the farmers to protest about "unfavourable terms of trade." But the artificial peak in wool prices has passed and it is doubtful whether they will occur again.

Estimates of New Zealand's butter, cheese, and meat output for 1952 indicate that there is likely to be a drop. Butter production is expected to be up, but cheese and meat are down and in greater proportion. One of many reasons is the shortage of fertilisers as a result of the sulphur crisis. There is also a tendency for labour to drift from the land to the cities and to secondary commodity production. Easier labour can receive higher pay in the factories, so the farms lose.

Fortunately there is every sign that the Government does not intend agriculture's place in New Zealand's economy to be reduced. However, the steady pressure of economic facts often defeats the best of intentions. It may be propitious for Britain, New Zealand's main market, to consider whether the prices she pays for New Zealand food are sufficiently stimulating for those who produce it. It is good buying to make what is known as a good bargain, but it should never be so good that it tends to discourage the producer or his labour. In the long run Britain will be much worse off if the price she pays New Zealand for food is not enough to keep New Zealand's labour on the land.

Thermal Death Time Studies

EARLY investigators into the thermal resistance of spores of spoilage organisms and the rate at which heat penetrates into food products, both of which are important factors in determining the degree and duration of heat to be applied to canned foods for the purpose of preservation, assumed correction times for lag in heat penetration. Most of the correction factors proposed for this lag were small and practically negligible when compared with thermal death time (of the order of 10 minutes).

However, later investigators demonstrated that in thermal death time tests of relatively short duration (one to three minutes) the lag and come-up times become an appreciable percentage of the total thermal death time and that proper correction factors result in lower F and z values than when instantaneous heating and cooling are assumed without applying the corrections. According to the nomenclature of C. Olin Ball, F equals the number of minutes required to destroy the organism at 250°F., and z equals the slope of the straight-line semi-logarithmic thermal death time curve.

The purpose of a study by J. A. Stern, M. A. Herlin, and B. E. Proctor (reported in contribution No. 134 from the Department of Food Technology, Massachusetts Institute of Technology) was to develop a continuously recording device that would accurately measure and record large temperature changes in foods and other materials in short periods of time (from 15° to 400°F. per second), and to compare actual come-up curves with those calculated mathematically.

It was believed that an entirely electronic device would be best for the measurement of rapid temperature changes. The recorder described by the authors was developed independently by Luyet and Gonzales (*Refrig. Eng.*, **59**, 1191, 1951), who described and demonstrated the use of an almost identical device for the measurement of ultra-rapid temperature changes in materials during freezing processes. The authors' apparatus differs principally from theirs in the choice of the amplifier and in the calibration of the recorder.

After a full description of the apparatus and its use, the authors found that the temperature-time curve obtained by their method indicated that the sample treated, although liquid, was heated by conduction rather than by convection. A possible explanation for this may be that the gravitational force created by the change in density of the solution on heating was insufficient to overcome what is commonly called the "capillary force" of the tube. Consequently, the typical convection currents were unable to flow or be formed and the sample was heated by conduction.

As a result of this work, it appears that the mathematical method of Olson and Schultz (*Ind. Eng. Chem.*, **34**, 874, 1942) may be applied to the calculation of come-up times of small samples of material with little error in the results, even though the thickness of the container wall may approach that of the sample.

Compared with the overall come-up time, the lag ascribable to heat penetration (which must be considered in systems of larger dimensions) appears to be of little importance in systems of extremely small size where the temperature changes are exceedingly rapid. However, it may be concluded that, in the studies with hot oil baths, the time necessary for the sample, even though small in amount, to come up to temperature is considerable. Hence, rather than to assume an instantaneous come-up time or a small correction factor, the lethal values of the come-up temperatures should be accurately measured and calculated.

Seaweeds and Food

A USEFUL summary of the developments in the collection of seaweeds and in the elaboration of products therefrom is published in an article in *World Crops*, **4**, 12, 403. In days gone by, the collection of seaweed and the preparation of kelp for the manufacture of soda ash and iodine were an important industry in Scottish and Irish coastal areas. Owing to the development of other sources of supply, this industry declined with lapse of time, but of late years, especially during and since the war, a new industry has been developed as a result of research directed towards the production of alginates and other materials.

The article contains some historical notes and an account of the work carried out by the Institute of Seaweed Research, which, under the name of the Scottish Seaweed Research Association, was formed towards the end of 1944 at the instigation of a number of Government Departments and other organisations interested in seaweed utilisation with a view to providing basic information on which it was hoped that non-Governmental interest could build an industry based on Scottish seaweed. The primary intention was to bring useful employment to the crofters of the Scottish highlands and islands.

The difficult work of the location of Britain's seaweed beds was carried on for over two years in the Orkneys, during which it was found that between low water mark and seven fathoms there were growing 1,250,000 tons of seaweed.

Alginic acid and alginates, and mannitol are the principal products which have found industrial application. The remaining seaweed chemicals are so new that it is impossible to foresee the uses that might be found for them, although there are already indications that laminarin can be used as a substitute for blood plasma, and as a source of glucose.

Less is known about the chemistry of the red seaweeds, which are unlike the more abundant algae in appearance, habitat, and constitution. As far as is known, they do not contain any of the chemicals found in the brown weeds, although they do contain certain starch-like compounds which have already found many outlets in industry, *e.g.* agar-agar.

Lament for Muffins

IN asking where the muffin has gone nowadays Lord Asquith has certainly set a teaser to many muffin enthusiasts, even though His Lordship was deluged with samples after a one-line letter in *The Times*. Did the muffin go out when butter rationing came in? Or is it that it is recognised as an aid to indigestion, as many regard it?

The first query does not take us far, since the crumpet, with its perforations positively soaking up melted butter, is still at large in the shops though not hawked in the streets. "Crumpets is not wholesome, Sir," says a doctor in Sam Weller's days. Lord Asquith supports this view of a sorry substitute for a muffin in defining the crumpet as "that limp, lardaceous, pockmarked parody of the muffin." As the muffin has vanished, gone too (except in one or two rural areas) is the muffin-bell sounded to give, like the dinner gong to Pavlov's dogs, a pleasurable flow of anticipatory saliva and gastric juices on hearing it in the street.

W. S. Gilbert in *The Sorcerer* saluted the muffin, yet little or no literary references remain to support its claims for survival. The only example, and a derogatory one at that, came when George Bernard Shaw used it as simile for stodginess in *Man and Superman*: "Marry Ann, and at the end of a week you'll find no more inspiration in her than in a plate of muffins." Even in coming to present-day definitions, as in the O.E.D., we have our doubts on the muffin's value for older folk with inferior digestive powers. "A light, flat, circular, spongy cake eaten toasted and buttered at breakfast or tea," runs the description. But so many of the muffins we used to consume were anything but "light and spongy."

Sausage and Small Goods Manufacture

It was on a November morning in 1921 that George Brazil, on his return from five years' service in the first world war, set off with one hundred pounds of sausages and sold them in Aylesbury. Thus the first seeds were sown which by now have grown into a company that is one of the largest in England. It is now controlled by George Brazil and his brother John, who was connected with the original venture.

THE company, now known as G. Brazil and Co., Ltd., moved to its present site in Amersham in 1926 and has since opened factories at Witney and Winchester where manufacturing operations were considerably extended to include the production of a large range of pork pies and steak and kidney pies. Since these early days the range of products made at Amersham has been further increased to include a wide variety of cooked meats, such as brawn, liver sausage, luncheon sausage, pork galantines, black puddings, faggots, saveloys, savoury ducks, together with pressed hams, both canned and open-packed.

At the company's two other factories meat pies only are produced from the raw materials conveyed from Amersham by 12 ton articulated, refrigerated lorries, giving daily service. From these factories a sales service covering the majority of Southern England is operated and a similar service from Amersham covers London and the Home Counties.

After the carcass has been drained of blood, it is lowered into the scalding tank prior to the removal of the hair.

Stainless steel "fingers" remove all scorch marks from the carcass as it passes through the mechanical scraper.

A number of dairy farms in the Amersham area supporting Ayrshire herds and pigs are also controlled by the company. Pre-war, the practice was for the pigs to be brought in from these farms, supplemented by pigs from various markets, for slaughtering and curing for bacon on the premises. In these days of Ministerial control, pigs are allocated on a curing capacity basis, arriving from surrounding counties each week.

After killing, a certain percentage of these pigs is rejected as unsuitable for bacon and is retained by the company for manufacturing purposes, the bulk being put down for curing. When the cure is complete, the bacon is allocated by the Ministry of Food to various wholesalers and is delivered in bulk under refrigeration in the company's own transport.

Meat for the different varieties of pies and cooked meats is supplied, already slaughtered, through the Ministry of Food, large quantities of beef, pork, and lamb reaching the factory daily to meet its weekly output of pork and beef sausages, together with a wide range of meat pies and a heavy tonnage of cooked meats of great variety.

Slaughtering Operations

Pigs for slaughtering are penned adjacent to the abattoir and are driven as required into the stunning pen where they are electrically stunned and hoisted by the left hind leg to a conveyor running from the pen to the slaughterhouse. The sticking knife is then passed through the throat, severing the aorta.

After the carcass has been drained of blood, it is lowered into the scalding tank prior to the removal of the hair. This is carried out in a dehairing machine, into which the carcass is placed by

The carcasses are taken by overhead conveyor into the hanging and cooling room.

means of a hand-operated cradle which scoops it up from the tank into the machine in which it is revolved mechanically for two or three minutes, emerging at the other end with most of the hair removed. The carcass is freed from any remaining bristle by passing through a singeing machine and finally through a mechanical scraper, fitted with a water sprayer. It is in this machine that stainless steel "fingers" remove all scorch marks from the carcass as it passes slowly through by overhead conveyor, leaving it completely undamaged.

Any bristle that might remain

The meat passes by conveyor to the grinding machine.

The sausage ingredients are mixed in the bowl chopper.

after these operations is removed by hand by a sharp knife. When the intestines have been removed, the carcasses are taken by overhead conveyor into the hanging and cooling room where they remain for about 24 hours until they reach a temperature of about 40°F.—the suitable temperature for curing.

Bacon Curing

The sides required for bacon are taken into the curing room, and brine is injected by needle pumps, after which they are kept in brine tanks, 12 ft. in depth, for four to five days. After this period of immersion, they are drained and stacked in the curing cellar to mature for a week.

At the moment, smoking is carried out in the usual type of smokehouse with sawdust on the floor and the smoke, percolating through the walls on to the hanging carcasses, but the company has devised, and is now installing, a new type of smokehouse differing from the traditional designs.

Preparation of Meat

In the preparation department the meat for pies and sausages is boned, trimmed, and fed on to a conveyor leading into the hopper of the mincer. Emerging from this, the minced meat falls into stainless steel troughs for transport to the different departments.

For the production of sausages, the meat is placed into the bowl chopper where flavouring and filler are incorporated; thence it is passed to the filling machine from which it is extruded into casings, some of which are produced in the factory and some imported.

At the weighing and linking benches, women operatives deal swiftly with the sausages; some weigh them out in one pound batches, while others are concerned with linking and labelling. They are then conveyed through a cooling chamber prior to packing in cartons and ultimate despatch.

Top right: **Weighing, linking, and labelling the sausages.**

Centre: **In the kitchen pie fillings, brawn, and other products are made.**

Below: **The dough is passed through the dough breaks.**

Above: **The special feature of the automatic pie-making machine is that it moulds, fills, and lids the pies ready for the oven in one revolution of the table without handling.**

Right: **The baked pies emerge from the gas-fired electrically operated travelling oven and are placed on racks for cooling.**

Below: **After passing through automatic cooling chambers by refrigerated conveyor, the pies are conveyed to the packaging department for wrapping and bagging.**

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Meat Pie Manufacture

In the bakery are made the various types of pie casing, the fillings for which have previously been prepared in the kitchen where brawn and several other products are also made. The flour, water, and fats are first mixed in the single arm dough mixer, the dough being next passed through the dough breaks, cut into the requisite shapes and sizes for the different kinds of pies, thence to the automatic pie-making machine.

The special feature of this machine is that it moulds, fills, and lids the pies ready for the oven in one revolution of the table without handling. This is made possible by the introduction of the meat depositor, timed to drop the semi-solid meat into the pies in quantities varying from one to 24 ounces. This machine can also be used for the production of pies in tins, and for the hand-raised type without tins, moulded in standard cups or in hoops. To ensure safety of the workers, specially designed and electrically controlled safety guards are incorporated and a magnetic brake is fitted to the motor shaft for instantaneous stopping.

Constructed with a large circular table fitted with eight bases, the machine is driven with a 3 h.p. motor through a 44/1 reduction gear giving a "fast" speed of 1,800 per hour and a "slow" one of 1,080 per hour.

The pies are baked either in a gas-fired electrically operated travelling oven or in a single cycle oven. In the latter, to ensure even distribution of heat, the gas is fed in at high pressure.

The goods to be baked are rested on the oven stock and are pushed on to steel cradles circulating in the baking chamber. These steel cradles, 16 in number, each measuring approximately 6 ft. long by 18½ in. deep, are carried round the chamber on heavy duty chains. The pies are circulated once approximately every four minutes. An automatic thermostat is fitted to the front of the oven to ensure proper control of the baking operations.

Cooling and Packing

On emerging from the ovens, the pies are placed on racks for initial cooling prior to their removal from the tins. After jelly is injected, they pass on a refrigerated conveyor through automatic cooling chambers which reduce the temperature of the pies almost immediately to 40°F. They are then conveyed to the packaging department for wrapping and bagging.

In two extensive kitchens, a wide range of cooked meats is manufactured daily. When cooked, the goods are placed on racks for cooling and then conveyed to refrigerated chambers.

In the large maintenance department all running repairs to the vans are carried out and the factory plant is kept in good running order. In this department, new equipment is also designed.

The company employs no commercial travellers in the strict sense of the word, their method of distribution being by way of van salesmen giving a daily service to all their retail customers. The company itself owns two retail shops, one in Amersham and the other in High Wycombe, both of which are supplied from the Amersham factory.

Plans for the future include an even greater expansion in the production of meat products, such as canned soups and other meat packs, and also in the provision of further facilities for the staff.

(Concluded at foot of next column)

New Laboratory for Fish Research

THE Humber laboratory, with Dr. C. L. Cutting in charge, opened officially on December 5, is an offshoot of the Torry Research Station at Aberdeen, and has been set up in order to serve the English sections of the fishing industry. Both laboratories are part of the Food Investigation Organisation of the Department of Scientific and Industrial Research.

The Organisation began its work on the storage, transport, and processing of fish at the Low Temperature Research Station, Cambridge. Some 20 years ago the Torry Research Station was set up at Aberdeen so that the research on fish could be carried out at a fishing port and closer co-operation thus maintained with the various branches of the fish industry. Since that time Torry has worked on the day-to-day practical problems of the efficient storage, handling, and processing of fish from the moment of catching to its purchase by the customer. It has also conducted fundamental research into bacteriology and biochemistry which is essential to the satisfactory solution of those practical problems. The laboratory maintains its own trawler and among other things has contributed a great deal to the improvement of fish freezing methods which has taken place in recent years.

SUPPLIERS OF EQUIPMENT

Vehicles: *Bedford; Vulcan.*
Refrigeration: *Lightfoot Refrigeration Co.; Frigidaire; and the U.D. Engineering Co.*
Paper and paper bags: *Alf Warn and Son; H. J. Austin; Rappings Ltd.*
Gelatine: *O. Murray and Co.*
Cereal filler: *T. Lucas and Co.; John Crampton and Co.*
Butchery requisites: *G. Rushbrooke (Smithfield).*
Protective clothing: *Clare's Service; G. Rushbrooke (Smithfield).*
Conveyors: *Sovex Ltd.; J. Collis and Sons.*
Mincer, bowl chopper, etc.: *J. C. Wetter and Co.*
Weighing machines: *W. and T. Avery.*
Aluminium sausage trays: *Heston Aircraft Co.*
Dough break and mixer: *Morton Machine Co.*
Automatic pie maker: *Camwheat Pie Machine Co.*
Potato washer and peeler: *Avamore Engineering Co.*
Boiling pans: *A.P.V. Co.*

The exhibition arranged for the opening of the laboratory included sections dealing with the work which has been done at Torry on the problems of the fishing industry, the equipment to be used in the various sections of the Humber laboratory, and samples of stored and processed fish. The spoilage of fish is mainly caused by the bacteria present in the film of slime on the skin, the gills, and in the intestines of the fish. Specimens of various cultures of bacteria were shown, together with the results of work done upon their growth and activity.

Exhibits demonstrated the work done at sea and on distant water trawlers from Hull and Grimsby throughout the trips. Records were kept of the temperatures of the fish stored in ice in the usual manner. The special equipment used was demonstrated, along with some of the results of observations and experiments. Another exhibit illustrated the research being done on the freezing of fish and particularly the development of a freezer for use on trawlers. Samples of fish were shown to illustrate the importance of storing frozen fish at very low temperatures.

The Physics Section of Torry Research Station is concerned with the physical behaviour of fish during various processes of preservation. A particularly important problem is the accurate measurement of the water contained in fish and its environment. An electric hygrometer has been developed, and work on its behaviour is now in progress at the new laboratory. This new instrument consists of a probe incorporating an electrical condenser sensitive to minute changes of moisture content. When the probe is inserted into the specimen, the moisture content can be read at once on an instrument or can be recorded graphically. Its remarkable sensitivity was demonstrated in this exhibition. Apparatus for testing and calibrating the probes was also shown.

The exhibition included a working model of the mechanical fish smoking kiln produced at Torry, which is being increasingly adopted

by the industry. The kiln smokes and dries fish under controlled conditions of temperature, humidity, and smoke velocity. Apparatus now being developed to record the intensity of the smoke while the kiln is working was shown alongside. The measurement of the amount of smoke in a smoked fish was the subject of another exhibit.

An important section of the fishing industry is that concerned with by-products. Samples of these which were to be seen in the exhibition included herring oil and protein products obtained by a new process developed at Torry Research Station. Current research on fish proteins and fish skin was also described.

Fibres Natural and Synthetic

FROM the January, 1953 issue *Textile Industries and Fibres* assumes the title of FIBRES NATURAL AND SYNTHETIC with a full page size of 12 in. by 9 in.

The change has been made as the result of a world survey of the countries producing and using fibres and to maintain the Leonard Hill tradition of publishing technical journals which apply chemistry and science to industry.

The new Journal will deal with the production and usage of all natural and synthetic fibres for the manufacture of textile and other fibre products. As a review of world fibres progress, emphasis will be laid on scientific and chemical methods within the industry. In the Journal will be published reports of new materials; chemical applications; machinery; research; and methods applicable to laboratory, factory, and mill practice.

The January issue will include:

"The Chemical Structure of Fibres," by R. W. Moncrieff, B.Sc., F.R.I.C., F.T.I.

"The Chemist in the Wool Mill," by Dr. E. G. Carter.

"Orlon Dyeing with the Use of Copper Salts," by A. J. Hall, B.Sc., F.R.I.C., F.T.I.

"Possibilities of Long Staple Cotton," by C. H. Brown.

"Systems of Ramie Manufacture," by S. A. G. Caldwell.

International Digest, Symposium, News, and World Market will be regular features of the Journal.

World Trade in Meat

WORLD meat production has remained much greater than before the war, but as consumption in the main producing countries rose further during 1951, international trade in meat for that year declined to about four-fifths of the 1938 figure, according to a recent report* of the Commonwealth Economic Committee. Although Commonwealth exports shared in the decline, the proportion of world trade in beef and veal of Commonwealth origin remained at about two-fifths of the total; on the other hand, the Commonwealth share of world exports of mutton and lamb rose to nearly nine-tenths while those from foreign countries fell more heavily, mainly as a result of the cessation of exports in the early months of the year from South American countries to the United Kingdom.

Output of beef and veal in Australia, New Zealand, and Argentina declined appreciably in 1951 and in North America there was also a considerable fall, but production in the United Kingdom continued to increase. Mutton and lamb output in the main countries concerned, except Australia, also declined substantially. On the other hand pig-meat output increased in most countries, especially in the United States of America and Western Germany.

World exports of beef in 1951, which fell heavily for the second year in succession, were less than one-half of the pre-war level, chiefly owing to the substantial reduction in shipments from Australia, New Zealand, and Argentina. Trade in mutton and lamb also declined appreciably and for the first time in post-war years fell below the 1938 figure as the lower level of production affected exports.

The continued expansion in bacon shipments from the main European countries concerned was not sufficient to offset the heavy reduction of those from Canada, with the result that world trade fell slightly and was no less than 35 per cent. below the pre-war level; world exports of pork, however, showed a further increase and were substantially greater than in 1938.

Trade in canned meat rose sharply in 1951 owing mainly to the expansion in exports of canned pig-meat from European countries but was still only about three-fifths of the record level reached just after the war.

Exports of beef from Commonwealth countries, which accounted for about one-quarter of the world trade before the war, had risen to 38 per cent. in 1950 and remained at this level in the following year. For mutton and lamb, Australia and New Zealand accounted for 88 per cent. of the total trade in 1951 as against 80 per cent. pre-war, the decline in Commonwealth supplies being less marked than that for other countries. As shipments of bacon from Canada were small in 1951 and those from Europe increased, the Commonwealth share of world trade was negligible. Commonwealth countries continued to account for almost one-fifth of the world trade in canned meat.

Consumption per head in the main producing countries, which had shown a marked upward trend in previous years, declined appreciably in 1951, except in New Zealand and Canada. Consumption in Australia and the United Kingdom was still much less than before the war, but in New Zealand supplies were slightly greater than pre-war. In Argentina consumption declined for the second year in succession but was 16 lb. greater than in 1938.

United States consumption, after remaining virtually unchanged in the previous three years, fell by 6 lb. during 1951 but was still 12 lb. above the pre-war level, while in Canada there was a recovery from the decline recorded in 1950 and *per caput* supplies were 15 lb. higher than in 1938.

In the United Kingdom the level of consumption, which had risen sharply in 1950, fell again in 1951 and was 45 lb. lower than pre-war.

* *Meat*. Pp. 98+xii. Published for the Commonwealth Economic Committee by H.M.S.O. Price 5s. net.

The Chemistry and Physics of Macaroni Products

Part VI

J. A. Radley, M.Sc., F.R.I.C.

The analytical examination of macaroni products is discussed in this concluding instalment of the series. In the average macaroni factory, the analytical determinations generally made are moisture content and ash, while appraisal of colour is usually carried out by subjective judgment alone. Supplementary information is sometimes required for particular purposes, as, for example, in the cases of complaints on the flavour of the product or on the curdling of milk which occasionally occurs during cooking. In such cases a determination of the *p*H value of a water extract from the product and the titratable acidity of this extract can often be of value in determining the cause of the trouble.

ONE of the determinations regularly required in a macaroni factory is that of the moisture content of the product. With starch, dextrins, and other cereal products there has often arisen much doubt as to which is the best method of estimating this value.

Sair and Fetzer[63] in a series of long papers have compared the results obtained by five different methods to ascertain the moisture content of maize flour, gluten, and gluten meal. Although their work was not directly concerned with semolina or macaroni products, it is of present interest because of the similarity of the problem and the materials used.

Maize ground to 40 mesh dried in an air oven at 100°C. for 130 hours still contained moisture, since when further dried at 100°C. in the oven over phosphorus pentoxide which avidly absorbs moisture, it showed a further loss in weight. Dried in a vacuum oven over phosphorus pentoxide at 38° to 50°C. the moisture value was essentially the same as that obtained by the benzene or toluene distillation methods. In the benzene method the material is boiled in benzene for 70 hours and the water separating in the distillate is measured. Similarly with the toluene method, except that the heating is carried out for 20 to 45 hours instead of 70 hours. If solvents boiling at higher temperatures are used higher moisture values are obtained but this is undoubtedly due to decomposition of the material.

The official methods of the American corn industry for estimating moisture are therefore shown to underestimate the moisture present in maize and in maize gluten. The failure of the oven methods may be attributed to a case hardening effect of dry heat and, in the case of maize products, to a loss of volatiles-not-water. In all cases the toluene method appears to be reliable and the above workers consider the "reversibility method" also to have a wide application to a wide variety of products.

Rapid Test Wanted

Obviously moisture tests requiring over 20 hours to perform are unsatisfactory for routine control and a demand for a rapid and accurate moisture test in the macaroni products industry is evident.

The powdered product is generally dried in most laboratories and there has been quite a lot of study given to the elaboration of a quick and reliable oven method for use in routine control. Coleman and Dixon[64] used a special type of drying oven which gave satisfactory results in 15 minutes. Davis reported in 1935[65] that many cereal laboratories shortened the time from the one hour required at 130° C. by the use of higher temperatures, combined with a special forced-draught air circulation. This worker considered forced-draught to be more efficient, chiefly owing to the improved heat transfer it engendered, and not to the removal of vapour.

Following this up Anderson[66] showed that the time to heat a sample to 100°C. in a vacuum oven could be reduced from 90 minutes to 10 minutes if the sample were placed on a hollow brass plate through which steam was circulated.

R. M. Sandstedt[67] found that samples could be dried in a very much shorter time if they were contained in a good heat conducting dish. Aluminium dishes were used in his work; on removal from the oven they were covered with an aluminium lid and placed upon an aluminium plate which cooled them rapidly. A desiccator for cooling was found to be unnecessary if the samples (wheat flour and ground wheat) were not left for more than about five minutes after becoming cold before weighing. Ground wheat required heating to 140°C. for 20 minutes by this method to give good results and it would appear that the method should be applicable to macaroni products in the course of manufacture. His method was tested in a collaborative study[68] and received favourable comment.

Instruments at Present in Use

Certain instruments which give reproducible, if somewhat empirical results, are used in a number of factories in this country, for example, the Brabender moisture apparatus and the Chopin moisture meter.

In the Chopin instrument, 5 g. of sample in a special aluminium dish is counterpoised on a special balance and then placed in a tight, close-fitting chamber, the temperature of which is thermostatically controlled at 200°C. The moisture is rapidly driven off and passes through a container filled with calcium carbide and the resulting acetylene is ignited on issuing from a burner at the top of the instrument. When the flame dies down to a given height, the dish is removed, placed on an aluminium cooling block, covered with an

aluminium dish until cold (two to three minutes), and then replaced on the Chopin balance. The pointer is brought to between zero and one on the scale by adjustment of the rider, when the percentage moisture originally present in the product is given by the combined readings of the rider and the pointer.

This method is very convenient for small factories where numerous samples do not require to be examined simultaneously, since the determination takes approximately five to seven minutes from start of weighing to obtaining the final result.

Where a number of samples is to be examined simultaneously, the Simon Carter oven or the Brabender instrument is normally used.

Iron Determination

Munsey[69] finds that the method of determining iron in enriched flour and bread given in the A.O.A.C. Methods of Analysis, 1945, 239, paras. 20-9, 30-12, can be satisfactorily applied to enriched macaroni products.

Test for Lecithin

Since addition of lecithin to macaroni products is permitted some work has been carried out by Winston and Jacobs[70] to distinguish between the presence of soya bean lecithin and the lecithin that would be present due to added egg products. Five g. of the sample are treated for 30 minutes with 7 ml. of 95 per cent. alcohol and 0·5 g. of sodium sulphate, after which 93 ml. of naphtha are added, shaken, and allowed to stand in the dark overnight. The clear supernatant liquid fluoresces in ultra-violet light of wavelength about 3,700 Å to give a bluish colour.

The intensity of the fluorescence can be measured using Nessler's tubes or in a fluorimeter of any standard pattern, the fluorescence of the solution being passed through a filter with a maximum transmission at 4,700 Å before being observed or recorded. This type of set-up is identical with that used to measure the fluorescence of thiochrome solutions.

Farinaceous and egg products show only a slight fluorescence compared with soya bean lecithin and the addition of 15 per cent. of soya flour does not interfere. The fluorescence obtained with soya bean lecithin is practically proportional to the concentration used; hence it can be used to determine the amount of added lecithin in macaroni products. As little as 0·5 per cent. addition is detectable.

Additions of Non-wheat Cereals

For the determination of flours, other than wheat or maize, in macaroni products, di Stefano and Visintin[71] recommend the repeated extraction of 6 g. of the powdered material with 70 per cent. ethanol until about 80 ml. of solvent have been used. The whole mixture is made up to 100 ml., left for five hours, with occasional shaking for the first three hours, and then filtered. Fifty ml. of the filtrate are slightly acidified with sulphuric acid, taken to dryness on the water bath and then digested with 10 ml. of concentrated sulphuric acid, 5 g. of potassium sulphate, and about 1 g. of copper sulphate for the usual nitrogen determination. The nitrogen figure may be indicated by B. The total nitrogen content of the original sample (3 g. of which are used for the determination) may be designated as A.

The authors find that the ratio A/B is about 0·6 for cereal flours, but is significantly reduced by admixture with bean, chick-pea, or rice flours, all of which have been, and are, sometimes used as a substitute for cereal flours.

Another test is to determine the fraction of the product soluble in boiling water, since this fraction is greater when the above additions have been made. Detection of the presence of maize in wheat products would be quite readily carried out by a microscopical examination or by the test of Brucknor and Thomas,[72] in which 0·16 N potassium hydroxide is applied to the separated, starchy portion of the product, when wheat starch swells and maize starch is unaffected.

As previously mentioned, the pigments from wheat may be extracted by the use of a suitable solvent and in this manner the suitability of Mindum wheat for macaroni making, from the point of view of colour, was first indicated.

Winton[73] introduced the "Gasoline Colour Test" for flour pigmentation and from 1911 until 1938 the majority of investigators used some form of petroleum hydrocarbon as extractant. Thus, Coleman and Christie[74] also used clear, colourless gasoline. D. W. Kent-Jones[75] used two extractions, the first, for carotenoid pigments, employed "petrol." Ferrari and Bailey[76] developed a spectrophotometric procedure, and at first used petroleum ether and later[76] high test gasoline.

Ferrari[77] later modified this solvent by the addition of 7 per cent. absolute ethyl alcohol and the use of "light cleaners' naphtha" (boiling range 93·3° to 160°C.). Whiteside,[78] in his extensive work on wheat pigments, used gasoline for flours and a procedure involving pre-treatment with ammoniacal alcohol for the ground wheats. Geddes *et al.*[79] used varnish makers (Stoddard's solvent) naphtha alcohol (93·7) in his simplified colorimetric estimation of flour pigments. Simpson[80] appears to be the first worker to deviate from the use of petroleum hydrocarbon extractants by employing 100 per cent. acetone.

Selection of Solvents

The ideal solvent for this work should have high solvent power for carotenoid pigments but low solvent power for chlorophyll and flavone pigments, give clear extracts, have uniform composition, moderate boiling point, low fire risk, be non-toxic and unobjectionable in odour, insensitive to atmospheric or sample moisture, low in cost, and have ease of recovery. Binnington, Sibbitt, and Geddes[81] after examining 60 solvents selected n-butyl alcohol as the best. When used saturated with water it gives bright extracts which are essentially carotenoid in character. The specific transmission indices of carrot carotene and xanthophyll in this solvent are 1·6632 and 1·7225, respectively,

determined in a 10 cm. cell at 4,358 Å.

They compared this solvent with the naphtha alcohol solvent using 140 hard red spring wheat flours, obtaining better extraction in each case with the former. The sample moisture was found to have but little effect on the former solvent but may seriously affect the latter and from the author's experience n-butyl alcohol can be confidently recommended.

Major Components of Wheat

Wheat consists of two main components, the protein component, gluten, and the carbohydrate component, starch. In addition there are a number of minor components whose effect may, in certain circumstances, be appreciable but about which little is known in relation to the macaroni industry.

It may be well to consider each major component separately, comparing the properties of that derived from durum wheat with those shown by the corresponding component of vulgare wheat in order to determine if there appears to be any connexion between the properties and the suitability of each type of wheat for a specific purpose.

Starch Content

Eva, Levi, and Anderson[82] determined the starch content, in an extensive collection of samples of hard spring wheat, to have a mean value of 53 per cent. In a collection of durum wheats the mean starch content of all grades was 54·1 per cent. and in a collection of Alberta winter wheats the average was 54·4 per cent. In general they found the starch and protein contents to be inversely related. It should be noted that these workers estimated the starch by a calcium chloride extraction/polarimetric method, assuming the specific rotary power of starch to be 200°.

Starch-swelling Properties

Mangels and Bailey[83] found that durum wheat starch exhibits a greater swelling capacity when treated with caustic soda or urea solutions than did starches from the common or vulgare varieties. No such differences were shown, however, between durum and hard winter wheat starches when treated with thiocyanate, iodide, and sodium salicylate solutions which are also swelling agents for starch. Hard spring wheat showed less response and they concluded that the first two wheats were, therefore, more suitable for macaroni making.

Vogel and Bailey[84] had earlier found no chemical or physical differences between durum and vulgare wheats, except that the viscosity of leached and acidulated suspension of durum wheat flour was lower than similar preparations from vulgare wheat flour.

Action of Swelling Agents

The action of swelling agents is closely parallel to the action of heat and water on starches, so far as swelling of the starch granules goes. The above work tends to indicate that one of the reasons why durum wheats give macaroni of superior cooking properties to vulgare wheat is that the swelling and water-holding capacity of the durum starch is superior to that shown by vulgare wheat starch.

Mangels[85] confirmed the difference in behaviour of durum and vulgare wheat starches with 0·1 M caustic soda solution and further notes that, in general, wheat grown in hot, dry seasons was less susceptible to the action of swelling agents than when the grain was grown in seasons of lower temperature and more abundant rainfall. In a further paper[86] he again lays emphasis upon the varietal and regional effects upon durum starches, finding both are evidently subject to variation. The ash and phosphorus contents showed variation, and there was considerable variation in the susceptibility to malt diastase. The viscosity of cold gelatinised preparations showed considerable variation.

In this paper he considers that there is some indication that low phosphorus content is associated with high susceptibility to diastase, but Kubanka and Mindum starches prepared from wheat grown at one location, *i.e.* Dickinson, were higher in both phosphorus content and diastatic susceptibility than starches prepared from the durum wheats grown at the other location, *i.e.* Fargo.

A correlation coefficient of approximately +0·70 between diastatic susceptibility and viscosity with sodium hydroxide (six hour observation) was obtained, but diastatic susceptibility and viscosity with potassium thiocyanate or urea solutions or by heat gave negative coefficients.

Correlation by rank of viscosity with sodium hydroxide, with viscosity in potassium thiocyanate urea, and hot water gave values of +0·30; +0·18; and +0·09 respectively. Correlation of viscosity with potassium thiocyanate and viscosity with urea and hot water, however, gave values of +0·92 and +0·61 respectively.

Viscosity with sodium hydroxide is, therefore, to some extent related to diastatic susceptibility of the starches, while viscosity with such cold gelatinising agents as potassium thiocyanate and urea is related to the properties of paste prepared with boiling water.

Susceptible Starch Varieties

Durum starches in general are more susceptible to diastase and give higher viscosity values than hard red spring wheat starches. The varieties represented in the starches examined consisted of two very satisfactory commercial varieties, Kubanka and Mindum; two unsatisfactory commercial varieties, Monad and Pentad; and a new variety whose characteristics are not well known, C.I. 8882.

Pentad and C.I. 8882 starches are evidently more susceptible to diastase than starches of other varieties. Pentad starch showed a very high viscosity when treated with 0·1 molar sodium hydroxide and with the exception of wheat grown at Langdon, Monad starch showed a higher viscosity than Kubanka and Mindum starch. Since, in general, Kubanka and Mindum macaroni have better cooking qualities than Pentad or Monad macaroni, it may be that an extremely high viscosity is undesirable.

While Pentad starch showed high viscosity with sodium hydroxide, it is among the lowest in vis-

cosity when treated with potassium thiocyanate solution, urea, boiling water, or boiling salt solution. Pentad starch showed consistently low viscosity when treated with boiling 3 per cent. salt solution and the same is true for C.I. 8882 starch. Since macaroni products are very often cooked with salt, this difference may have some significance.

Mangels' work would indicate that durum starches are probably subject to greater regional variation, due to seasonal climatic differences, than hard red spring wheat starches (Mangels, 1934). The 12 starches studied were prepared from wheat of the 1933 crop, and the growing season at all three locations was abnormally dry and hot. Dickinson actually had more rain during the growing season than Fargo, and Langdon less than Fargo. The Langdon wheats were seeded later and matured later than the Fargo or Dickinson wheats, and this may account for some of the peculiarities of the Langdon starches.

Total Phosphorus Content

Kniaginichev and Gorelkina[87] observed rather substantial variations in the total phosphorus content of several genetic species of the genus *Triticum*. Two samples prepared from T. durum contained 0·103 and 0·104 per cent. respectively, while two vulgare varieties contained only 0·061 and 0·055 per cent. It would appear, therefore, that too much stress should not be laid upon any connexion between swelling power and phosphorus content, since Mangels (*vide supra*) noted an inverse ratio between phosphorus content and swelling capacity of starch granules, whereas the work of Kniaginichev and Gorelkina would lead one to expect a direct relationship.

In view of the possible effect of enzymes on the starch, the work of Anker and Geddes[88] is of interest. They added increasing proportions of takadiastase to suspensions of durum, soft winter, hard red spring, Minnesota winter, and soft wheat starches and followed the gelatinisation and other characteristics in the Amylograph.

In the presence of appreciable amounts of takadiastase, durum wheat starches retained their viscosity the best, the maximum viscosity was reached at a much higher temperature than for other starches, they showed a much higher diastatic activity, and the transition temperature, *i.e.* the temperature at which the paste formed on heating, was among the three highest. Minnesota winter wheat starch showed the lowest transition temperature.

Obtainment of Maximum Value

These results indicate that, in general, macaroni requires heating in water to a higher temperature than bread wheat to obtain maximum volume increase and that when formed the gelatinised mass is more stable or less easily disintegrated than bread wheat. The high diastatic activity may well be indicative of injury to the granules, which might be expected in milling a harder, glassy grain, or of the presence of a greater amount of naturally occurring diastase.

Of interest, also, is the work of M. C. Markley,[89] not so much from the point of view of differences between durum and vulgare starches as from general considerations. The role of starch in flour doughs has long been considered to be merely that of a filler and a substrate for amylase activity. This view probably grew out of the early work upon the viscosity of dilute flour/water suspensions in which the protein appeared to be all important and the starch to be without effect.

When systems such as doughs, in which the flour concentration exceeds the water content by 100 per cent. or more, are considered it is probable that conditions may be quite different from flour suspensions where there is four to 10 times the amount of water as of flour.

Colloid Behaviour

Markley worked with mixtures of 300 g. of starch and 213 ml. of water to study the colloid behaviour of systems in which there was a preponderance of starch. He finds the starch-water system is definitely thixotropic, *i.e.* acts like a jelly when not stirred but goes fluid on stirring. This indicates that the starch is one of the most important factors in determining the viscosity or mobility of a dough since it constitutes 60 to 75 per cent. of the dry matter. It probably exercises an important effect during the extrusion process, but work will be necessary to determine precisely what the magnitude of this effect is and whether durum and suitable semolinas give different effects from unsuitable material.

Very little work has been published on the differences between durum and vulgare wheats from the point of view of their enzyme systems.

Effect of Enzymes during Processing

The enzymes in wheat exert a very distinct effect on its properties when used in the baking industry and there may be likely points of contact between the macaroni and the baking industries from this point of view. Since so little work has been done a wide field of research awaits development in this connexion, and the following speculations are based on possible similarities or differences between the two types of wheat, durum and vulgare, or between those wheats which are suitable for macaroni making and those which are not.

Amylases

Wheat contains two enzymes, both of which can attack starch. That which causes it to liquefy and break down into dextrins is the alpha amylase (α-amylase) while that which causes starch to break down into sugars and dextrins is the beta amylase (β-amylase). The amounts of these substances present in wheat are found to depend on both variety and environment and stage of growth.

Elizarova[90] found that spring wheats had more β-amylase than winter wheats. Kneen and Hads[91] found that with hard red winter wheats the β-amylase content is influenced by variety and environment of growth. They found a correlation, within the varieties, between the protein content and the total amount of β-amylase present but not with the amount

readily soluble in water. Wide variations in the water soluble β-amylase content of a number of Australian bread flours have been noted by Dadswell and Wragge,[92] while Meredith, Eva, and Anderson,[93] in an extensive study of flours from Canadian hard red spring wheats, found that the varietal means for total β-amylase activity varied from 42·1 to 26·8 units.

Damaged and Undamaged Granules

Undamaged starch granules are not attacked by β-amylase[94, 95] although wheat flour does appear to contain an amylase which can affect undamaged starch granules. Mechanically damaged, or partially or wholly gelatinised, granules, however, are readily attacked. Furthermore, "native" (*i.e.* raw, undamaged) starches from different plants show varying degrees of resistance to attack by amylases, and durum and vulgare wheat starches differ in their resistance to amylase attack. Different degrees of susceptibility to attack by β-amylase are also shown by gelatinised starches from different plants and again in the case with durum and vulgare wheat starches.[96] One peculiarity of durum wheat is the greater susceptibility of its starch to diastatic attack and this may account for its reputedly better digestive properties, although these have never been satisfactorily and scientifically demonstrated.

In commercially milled wheat flours the amount of starch granules damaged mechanically, during milling, varies with the hardness of the grain, and in soft wheat 1 to 2 per cent. of the starch granules are so damaged, in hard wheat flour some 3 to 4 per cent., while in durum flours from 6 to 8 per cent. are damaged.

In wheat flours there is ample enzyme by comparison with the small amount of susceptible starch present so that the activity of the system is not limited by the amount of amylase present but by the amount of damaged starch. By making a dough or a suspension of wheat flour in water and measuring the amount of sugar formed on standing (the "maltose value") some estimation of the susceptibility of the starch present can be obtained.

Many workers have shown the dependence of maltose figures on both the substrate (starch) and the amylases; others have shown that the variety of wheat and its environment of growth are important factors, while others have shown a correlation between mechanical injury in milling and maltose production in the doughs or water suspension. It may be significant that durum wheat often contains a high percentage of sugar and is often used in small proportions with a breadmaking wheat to remedy a lack of sugar in the latter.

All these points may have important consequences in macaroni production. Durum wheat is hard, sustains more damage in milling, and is, therefore, more prone to amylase attack after the semolina has been mixed with water than would be the case with hard wheats or soft wheats. Conversion of the starch would proceed during any mixing, resting, and drying periods, the latter being a comparatively long one at temperatures which would normally greatly speed up the conversion of starch to sugar and dextrins.

Again, during the extrusion process, more starch granules may be damaged and become available for amylase attack. If maltose and dextrins are produced in appreciable quantities in processing no information is available as to whether this is a good or a bad thing. Some dextrins appear to make flexible films of starch containing them and it may be that the suitability of durum wheat for macaroni making is, in part, owing to the greater formation of dextrins or sugar during processing than with other wheats.

Role of Alpha Amylase

With regard to the role of the α-amylase only small quantities of this are present in ungerminated wheat but a great deal in germinated wheat. This may explain the unsatisfactory behaviour of germinated wheat or wheat containing germinated grains previously discussed. Before germinating, wheat contains about 0·043 units of α-amylase. After three, four, or five days' germination Kneen, Miller, and Sandstedt[97] found 40·5, 90·7, and 238 units respectively to be present. Alpha amylase can attack undamaged granules and cause them to liquefy, thus a firm "dough" of starch and water apparently becomes more fluid. This amylase is also more resistant to high temperatures than β-amylase so that, although the speed of action of both increases with temperature, up to a certain limit, the β-amylase begins to be "killed off" at temperatures where α-amylase is operating at an enhanced degree.

Since α-amylase can attack undamaged, damaged, or gelatinised starch granules it may be that it exerts an influence in the drying process. As is generally known in the trade after extrusion the product is fanned for a short time with hot, dry air to strengthen it and make it easier to handle. When allowed to rest in a humid atmosphere for a short time it sweats. This is generally attributed to the moisture in the product redistributing itself evenly throughout the mass. On the other hand, it may be that there is, concurrently, an attack by the α-amylase on the partially gelatinised starch present which would liberate free water previously held by the partially gelatinised portion of the starch. Such action would also tend to influence the amount of soluble material lost by the product on cooking in water. During the rest of the drying period the above action would be continued, but at a slower rate, as the moisture was removed.

Amylases—Beneficial or Harmful?

Whether or not such action takes place needs thorough investigation in conjunction with the problem of the mode of migration and removal of water during drying. If amylases were found to be beneficial, agents could be added to assist one or other, or both, of them in their action; if detrimental, substances are known which would inhibit their action.

If, for example, α-amylase activity was found to be detrimental, the observations of Kosmin[98] and Kneen, Sandstedt, and Hollenbeck[99] might be put to use. They found that adjusting the

acidity of doughs to *p*H 4·4 effected irreversible inactivation of the α-amylase. On the other hand, if its effect were beneficial, it could be protected from destruction by the addition of calcium salts.

Such knowledge might well open the way for new methods of processing and the use of wheats and other materials at present considered unsatisfactory or inferior to durum wheat.

Removal of starch by amylases may well considerably alter the final characteristics of the macaroni product by decreasing the water holding capacity of the final product; at the same time dextrins and sugars may be formed which plasticise the product in the uncooked state, giving greater flexibility to long goods with a lower breakage rate while the drying process might be speeded up without detriment to quality.

Lipoxidase

The enzyme lipoxidase accelerates the oxidation of fat and carotene. It is present in large amounts in soya bean meal but has also been found in wheat, being present to the extent of 35,000 units and 810 units per gram of dry weight soya bean and wheat respectively.[100]

Previous discussion of this enzyme has shown it to be of interest in that it not only accelerates the development of rancidity in fat but also because it causes loss of carotene, vitamin A, and ascorbic acid. The loss of carotene would lead to a dull-coloured macaroni owing to the destruction of part of the yellow colouring matter present. If ever a manufacturer were tempted to include a small proportion of soya bean flour in his macaroni mix it would be of interest to recall that Haas and Rohm[101] used such an addition for bleaching xanthophyll and carotenoid pigments of flour doughs.

The history of our knowledge of lipoxidase is comparatively brief. In 1931, Hange and Aitkenhead[102] reported finding a carotene destroying substance in alfalfa, while in 1932, Andre and Hon[103] found an enzyme in soya beans that could oxidise the fat. In 1940, it was demonstrated[104, 105] that the so-called "carotene oxidase" found in soya beans could oxidise carotene only in the presence of unsaturated fats. Sumner[106] showed that the bleaching of the carotene required that the oxidation of the fats be actually in progress, and both this worker[107] and Strain[108] believe carotene to be bleached by an intermediate or nascent product resulting from the oxidation of unsaturated fats. Balls, Axelrod, and Kies[109] found that purothionin, isolated from wheat flour, inhibits the oxidation.

Carotenoid Content and Colour

In the work of Binnington and Geddes,[110] who found no correlation between the carotenoid content of durum wheats and the colour of macaroni made therefrom, it may be that some factor, then unknown, operated to render such a correlation impossible and that the lipoxidase may have been this factor.

The same workers[111] in previous work had pointed out that the loss of carotene on storage was well known and, indeed, desirable in bread wheats, and examined the carotene loss under various storage conditions of macaroni products. They noted a considerable drop in pigment content between semolina and spaghetti produced therefrom which appears to be due to change of colour of the flavone pigments which exhibit an "indicator" action and partly due to change in the conditions of the association of the carotenoids or to their absorption.

Other Influences on Pigment

This loss of pigment is only apparent, as can be shown by using certain solvents which leach out as much pigment from the finished macaroni as from the original semolina, despite the apparent loss of colour. The conditions of storage in order of increasing loss of pigment were vacuum storage, sealed containers, and unsealed containers. The amount of loss also increased from low to high temperatures and was greater in daylight than in the dark. These facts certainly support the more recent investigations previously discussed.

Catalase Activity

The enzyme catalase decomposes hydrogen peroxide to water and oxygen. The catalase activity of wheat has been studied by many workers who have shown that catalase activity is lowest in the endosperm and highest in the bran and peripheral layers of the wheat kernel, and that it increases progressively as the grade of flour decreases.

Blish and Bode[112] found Canadian flours to have nearly four times as much catalase as flours of a similar grade from Kansas and Texas, and spring varieties gave higher values than winter wheats grown under the same climatic conditions. Prokopenko[113] also found higher catalase activity in spring than in winter wheat and Ivanoff[114] reported higher catalase activity in wheats grown in northern or mountainous regions of Russia.

Catalase activity thus appears to vary widely in accordance with the origin of the wheat,[115] but whether and to what extent durum wheats differ in this respect from vulgare wheats does not appear to have been examined.

Enough has been given in the foregoing pages to indicate the scantiness of information with regard to certain aspects of the industry. Even in cases where quite a lot of work has been done, many questions still remain to be answered.

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TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of articles on the subjects covered. Books on food would also be considered.

Correspondence

To the Editor of FOOD MANUFACTURE

Fish Canning Problems

DEAR SIR,—The last few years have witnessed the number of canning firms engaged in the brisling and sild industry in this country increase to seven. This is indeed encouraging, especially for hundreds of inshore fishermen engaged in sprat fishing at many ports around the coasts of Great Britain and Ireland. When it is recalled that Norway has some three hundred canning factories almost entirely based on the fishing and canning of sprats and small herrings (brisling and sild), the enormous potentialities of a similar industry built up in this country should be apparent. There is no doubt whatever that huge shoals of fish similar to those canned by the Norwegians abound around the coasts of Great Britain and Ireland during the annual seasons from August to March. It should be the duty and the responsibility of the White Fish Authority, the Ministry of Agriculture and Fisheries, and the Board of Trade to harness this enormous and almost untouched wealth to the general food production and consumption of the people of Great Britain, Ireland, and the British Commonwealth, by fostering this outstandingly important brisling and sild canning industry.

If action on these lines should be taken it would be one of the answers to the oft repeated international question: "Will world food supply keep pace with population?" The Ministry of Agriculture and Fisheries is always concerned with growing more food. Why does not the Fisheries side of this Ministry take some interest in this neglected source of food supply on our very doorsteps, and at the same time do something to help the sorely tried inshore fishermen all around our coasts? The Ministry of Agriculture and Fisheries, the Board of Trade, and the Ministry of Food have done nothing for this industry in past years, but we now look with renewed hope to the White Fish Authority.

My Company has been canning these small British fish in this country for nearly 40 years, and there has been reached a production up to two million tins monthly all the year round, but never once has the industry received a helping hand from any Ministry; I would also state that never once throughout all these years and through two World Wars has a Ministry official ever approached the industry to enquire whether a considerable increase in production was possible. Mr. Strachey, a recent Minister of Food responsible for importing many millions of tins of foreign canned sprats into this country, admitted, after paying a visit to a brisling and sild canning factory in his own parliamentary constituency, that he had no idea there was such a flourishing industry in the country.

In pre-war years many successive Ministries have told me: "Norway must buy British coal, therefore Great Britain must buy Norwegian canned fish." No longer have we coal to export. So what now? Obviously, the time is ripe to develop our own British inshore fisheries and our own British fish canning industry. Certainly my own Company's production alone could be easily increased to one million cans weekly all the year round within a period of one or two years. We have two entire fish canning plants dismantled and lying idle following the closing of our factories at Deal and Colchester during the war. Huge regular supplies of beautiful little silver fish are available, the inshore fishermen in hundreds all around our coasts are fitting out with new and modern gear and urgently wanting to commence the new season's fishing operations.

But what is the present astounding position? After the 1914-18 war, the Government got rid of their stocks of canned fish collected from all parts of the world by selling large quantities every three months by auction in each big city of the country, realising

about 25 per cent. of the cost. This action brought my original Company down to its knees, and new capital had to be introduced to keep it above water. Immediately after the last war we were given an absolute assurance that no similar liquidation of Government or Ministry of Food stocks would be countenanced. However, since 1950 the Ministry of Food has been liquidating its stocks of foreign canned sprats and small herring at half price through the normal trade channels in direct competition with the home canners. Indeed, during the last three months the Ministry has sold to the ordinary trade some 15 million tins by Dutch Auction, realising 43s. or 44s. per case of 100 tins, against a probable cost of 70s. per case, but as the Ministry of Food's last contract with Norway was for 30 million tins of sild (small herrings) only and 25 million tins were shipped to this country during the first six months of 1950, what is the country to think of the position? It is easy to calculate the huge loss of public funds entailed by this unhappy procedure. The official retail price is 10½d. per tin, but it is well known that the tins are on sale in shops all over the country at 6d. and 6½d. per tin, against which competition the home canners cannot possibly sell their products.

The Ministry of Food has had no consideration for the home fish canners; it has been concerned only in getting out of the appalling mess which lack of knowledge of the industry and bulk buying generally have brought in their wake. Home stocks of brisling and sild in canners' hands are now increasing at an alarming rate, and in the case of my own Company, in addition to enormous stocks of canned fish, we still have nearly 100,000 stones of quick frozen fish left over from the last sprat fishing season, while the new fishing season has already opened.

The inshore sprat fishermen all around our coasts have relied on the home canners over a number of years to take their catches from October to March, my Company alone during the last fishing season purchasing 500,000 stones. Now, owing to the action taken by the Ministry of Food in liquidating so arbitrarily its huge stocks of foreign canned sprats and small herring without notice or consultation with the canning industry or the inshore fishermen, it will be a practical and financial impossibility for the home canners to purchase any important quantities of fish during the coming season. This serious and very unfortunate position in which the inshore sprat fishermen will find themselves will therefore shortly become a problem for the White Fish Authority. If, taking into consideration the Government subsidy of 10d. per stone on sprat fishing, the only way out is found to be the mass purchase of hundreds of tons of sprats from all ports for the offal factories, then it will indeed be an all-round calamity of the first magnitude.

Another reason for the unfortunate position and general paralysis in which this British fish canning industry finds itself is the entire closing down of the export markets of Australia and New Zealand at the beginning of 1952. In 1951, my own Company exported to Australasia British packs numbering 80 to 90 million fish to the value of £150,000, but in spite of opening several additional export markets it has not been found possible to replace business of such consequence.

At the present time, tins of Norwegian brisling in pure olive oil, complete with keys, are permitted to be imported into this country, but the home canner is not allowed to obtain a licence for the importation of olive oil, nor is he allowed to manufacture or purchase, or even use, any keys of British manufacture for the opening of the tins. Furthermore, the home canner, in view of the present high price of olive oil, requires to use deodorised groundnut oil, but is compelled by the Ministry to reduce the quality of his production by being forced to use 50 per cent. cottonseed oil. These handicaps against the very best and finest quality British production act severely against the home producer to the full advantage of the foreign canner.

The Admiralty supports the industry with large and important contracts for British brisling and sild, but the War Office, under the signature of Mr. Anthony Head, the Minister of War, simply advises that the Army personnel prefer the flavour of the foreign brands! The Air Ministry and N.A.A.F.I. still fail to support this British industry.

This young industry, based on the important work and toil of the inshore fishermen of this country, needs only a little sympathy and an occasional helping hand from the Ministries to become a very live, healthy, strong, and thriving one, equally as important to the world's food production as is the well-known Norwegian fish canning industry.

Obviously a fair deal in the home market is a necessity for the establishment of this British industry on a firm and ever increasing basis, and the export markets of the world under normal conditions hold out enormous scope for the consumption of huge quantities of "little silver fish in oil." I would take this opportunity of reminding the White Fish Authority that there is a far larger world demand for this fish than there is for canned fresh herrings or herrings in tomato sauce, which particular part of the fishing industry is so well looked after by the Herring Industry Board.

Healthy competition between the White Fish Authority and its sprat and pilchard, and the Herring Industry Board and its herring, would certainly be for the all round benefit of the canners and fishermen of this country.

Yours faithfully,

C. W. BANKS.

Leeds.

Our Contemporaries

Articles published in the associated journals of the Leonard Hill Group this month include the following:

"World Agricultural Production, 1952" (*World Crops*).

"Welding of Polythene and PVC," by C. Fisher (*Chemical and Process Engineering*).

"Air Disposal from Radioactive Laboratories" (*Manufacturing Chemist*).

Protein Extraction from Green Crops

After many years of experimental work, Mr. W. T. Powling and his son have devised the plant and process for the production of feedingstuffs from vegetable and other waste. The object of the process is to separate mechanically the moisture, fibre, and a nutrient concentrate, which they have called Protess, from green crops, vegetables, roots, fish, and meat offal.

BEFORE the war, protein in such forms as fish and meat meal, and the residues of the seeds from which vegetable oils had been crushed, was cheap and plentiful. This situation no longer existing, Mr. Powling and his son started their experiments with a view to finding some economical method of extracting protein from vegetable growths.

The amount of protein an animal can absorb is dependent upon the amount of fibre it is capable of consuming; even the heaviest consumer is unable to obtain sufficient protein for present-day intensive feeding. For other types of animals, such as pigs and poultry, the limitation is even greater. Hence, the necessity for the feeding of concentrated protein.

Raw Materials

Among the materials treated by the new process are grass, clover, lucerne, sugar beet tops, pea haulms, beans (before and after podding), lawn cuttings, nettles, bracken, coarse riverside grass, and cuttings from roadside ditches.

All the crops must be green when processed; an important point is that there appears to be no real need to be particular as to the stage of growth attained. Although a greater bulk of fibre has to be processed in a fully matured crop, rather than when a young crop is processed, the total recovery of Protess per acre and the protein contained therein is much the same. These facts alone indicate the economic possibilities of the process, as it means that harvesting does not become an urgent matter and the season for processing can be extended very considerably.

The Process

The process is a simple one. The raw green crop is passed through a pre-chopper to reduce it to short lengths. It is then elevated into the first Protessor in which the cellular structure of the material is broken down. The residue is then washed and passed to the second Unit which ejects the fibre, the dilute Protess being run off and heated to cause precipitation. The surplus water is then run off and the precipitate is available for storage or for further concentration by drying. The fibre which has been ejected has a moisture content of about 30 per cent. and a protein content of from 6 to 8 per cent. on a dry basis, thus providing good bulk feed. It can be ensiled or easily dried.

The fibre residue is in a warm damp condition as it leaves the plant. If spread on the floor up to about 2 ft. deep, it will dry out fairly quickly by means of its own generated heat, after which it can be stored.

Alternatively, it can be ensiled, or dried out and ground into a meal which can be cubed.

There are also possibilities that, in addition to its use as a good bulk feed, certain fibres may be suitable for paper making, fibreboard manufacture, and similar industrial purposes. It is also an excellent material for composting or even rotting down into organic manure.

The Protess, which can be stored in its semi-liquid state in tanks or silos, usually has a pro-

The plant for the production of feedingstuffs from vegetable and other wastes. *Photo Leonard Hill Ltd.*

tein content on a dry basis of between 30 to 45 per cent., according to the crop processed; some crops give even higher figures. Practically all the carbohydrates and the minerals in the crop are contained in this final product, but usually not more than about 4 to 6 per cent. of fibre is present. The only chemical used is a small amount of preservative.

Uses of Protess

For its utilisation, Protess can be mixed in its liquid or cheese form with cereals, either as a wet or dry mash. It can be cubed with cereals, or it can be mixed back with some of the extracted fibre residue. In all cases, the protein content of the feed can be controlled.

Powlings Patent Processes in conjunction with E. H. Bentall and Co., who have been responsible for the translation of the laboratory scale experiments to the present full size commercial plant believe that, with further refining, Protess may find considerable use as a nutritional substance for inclusion in manufactured soups, sauces, and similar foods for human consumption.

Quite apart from the fact that farmers now have a process available to them for the storage of green crops without recourse to drying, and the benefits of having ample supplies of a high protein content substance for feeding purposes, the Powling process is likely to have other uses in agriculture.

For example, stinging nettles produce a Protess having a higher protein content than most present-day crops. Furthermore, by virtue of its high chlorophyll content, there is the possibility of a very important market for the product in the industrial field. A very pure chlorophyll has already been produced from stinging nettle Protess on a laboratory scale.

One of the bugbears of farmers and horticulturists is the glut crop. Since most of such crops can now be processed to produce a valuable product, the ploughing-in operation can become a thing of the past.

Other possible developments are the production of Gari flour, starch and tapioca from cassava roots, the production of fruit pulps, the extraction of water from peat, of sugar from sugar beat, and of high protein-bearing concentrate from fish and fish offal.

Production Figures

Each unit plant will handle on average about one ton of raw material per hour. The cost of processing varies with different crops and different conditions of the crop, but on small scale production, say, about 500 hours working per year, including depreciation on capital investment and substantial allowance for spares and repairs, in addition to wages and fuel, the cost would be rather less than grass drying.

On large scale production, say, 4,000 hours working per year, the cost would be appreciably less and probably well below £10 per ton of dry Protess. In both cases, there would be the value of the residual fibre to be taken into consideration, which would bring the cost of the Protess still further below that of dried green crops.

Utilisation as Feedingstuff

As the process is an entirely new one, there is naturally no previous knowledge or experience to go by as to how best to utilise the products of the process as feeding materials. It is not difficult to visualise the possibility of feedingstuffs and other industrial manufacturers collecting the liquid or cheese Protess for further processing in their factories. A further development might be for an industrial concern to rent plants out to farmers, provided the latter supplied the former with a certain quantity of Protess per year.

The whole process provides an endless list of possibilities which await development in the manner in which those with initiative think most appropriate.

World Dairy Survey

THE reversal in the upward trend in milk production in many countries in 1951 and its effect on butter supplies is illustrated in a recent book.*

Output of condensed milk and milk powder in most countries has remained much greater than before the war, with exports closely following the pattern of production. A rise in exports of evaporated milk (unsweetened condensed) in 1951, most of which came from the United States, was mainly attributable to defence requirements and stockpiling, while Far Eastern countries received greater quantities of sweetened condensed milk, mainly from the Netherlands.

Commonwealth countries' share in production and trade in condensed milk is not large, but they are providing an increasing proportion of supplies of milk powder, which is used not only for baby food but also in the manufacture of many food products. A high percentage of United Kingdom imports of milk powder is of Commonwealth origin owing mainly to the preponderance of New Zealand as a supplier of skimmed and buttermilk powders; Australia also is an important source of skimmed milk powder.

Hen numbers and egg production in Western European countries, traditionally the main sources of egg exports, increased steadily up to 1950, but declined sharply in 1951, little change being evident in 1952. Thus, imports into the United Kingdom in 1951 were one-third less than in 1950 and less than half as great as in 1938.

The decline in imports compared with pre-war has been offset by greater home production, with the result that consumption per head in 1951 was estimated to be little short of the pre-war level; allocations for the ration amounted to 102 eggs per head in 1951 and have been about the same for 1952.

* *Dairy Produce, 1952.* Pp. 119+xv. Published for the Commonwealth Economic Committee by H.M.S.O. Price 5s. net.

Fats and New Zealand's Economy

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Although the *per capita* fat and oil production in New Zealand appears to be by far the greatest in the world, nevertheless there are many indications that it could easily be increased to advantage. Particularly is this so in connexion with the production of whale oil and wool grease which now appear to have greater economic possibilities than formerly. It is apparent that opportunities occur for the development of many new and profitable industries based on fats, such as tallow. To take advantage of these opportunities and to maintain the best qualities it will be necessary to make an even more intensive study of the fats and oils destined for export. This article points the way to achieve this.

THE importance of fats to New Zealand can hardly be overstressed, since either directly in the form of butter, tallow, fish liver oil, and whale oil, or indirectly as the major part of meat and cheese, they comprise the bulk of the country's exports.

The importance of invisible fat may also be gathered from the fact that in 1940 this form of fat represented 52 per cent. of the total edible fat consumption in the United States of America.[1]

Value of Visible Fats

The value of £48,164,000 estimated for the visible fat production in 1950 (comprising particularly butterfat) constitutes a considerable proportion of the total value of production. To this estimated value must be added many small items. For example, during the first nine months of 1950, 1,625 tons of copra valued at £87,000 were imported into Auckland from the Cook Islands and Samoa for the production of coconut oil, the yield of which is approximately 63 per cent.[2] Coconut oil is used for edible fat and soap manufacture. In 1949-1950, 598 tons of neatsfoot oil valued at £39,000 were prepared, and 606 tons of this commodity valued at £45,000 were exported.

Many other fatty substances, such as wheat germ oil, horse oil, mutton bird oil, beeswax, and wool grease have been, or are being, produced in New Zealand. Wool grease in particular seems to offer possibilities. Some is recovered from the wool scoured in New Zealand, but much the greater part is exported as greasy wool, in which form the grading and sorting is done mainly by Bradford firms. If such firms could bring their expert staffs to New Zealand for the wool sorting there seems no reason why all the wool could not be scoured there, thereby enabling the fats and the valuable potash salts to be recovered in New Zealand.

The New Zealand *per capita* meat production (614 lb. during 1949) is more than twice that of any other country, and this is reflected in a high production of animal fats. Still more animal fat could be produced, however, if the Antarctic dependencies, such as the Ross Sea, were exploited. This becomes apparent if New Zealand's production of about 700 tons is compared with the world production (mostly Norwegian and British) of 345,000 tons, worth about £35,000,000, apart from the considerable value of the by-products.

It is true that much of this oil will be hardened for margarine manufacture. However, the existing world supplies of fats are not increasing, and it appears that the unforeseen falling off in the productive efforts of mankind in relation to the rapidly increasing world population, will, for a while at least, create an unsatisfied demand for New Zealand butter as well as for margarine.

New Zealand still imports substantial quantities of oils and fats, amounting in 1949 to 1,023,700 gallons, costing £805,160. Despite the local fish liver oil industry with its considerable export market, this commodity is still imported to nearly the same extent as pre-war when there was no local industry.

Cacao butter has approximately the same fatty acid composition as mutton tallow but, because of a difference in glyceride structure, it has snap and brittleness required for chocolate manufacture. For this purpose £232,511 worth of this commodity was used in 1949-1950. It should be feasible to convert mutton tallow into a cacao butter substitute. Fats and

Butter manufacture at the Moa Dairy Factory, North Island.

Blocks of cheese curd " cheddaring " in a New Zealand dairy factory.

oils are to quite an extent interconvertible and need for importation could well mean a sad lack of technical development.

In addition to the biscuit, confectionery, paint and varnish, and soap and candle industries, many other industries use fats and oils. For example, considerable quantities of sulphonated oils are made mainly for use in the leather industry, but also for the woollen industry, for paints, and for cosmetics; from edible tallow very considerable quantities of cooking margarine are made

The Value of Fats in Nutrition

Fats are not essential for nutrition but may be very largely replaced in the diet by proteins and carbohydrates, as happened in certain European countries during World War II. Nevertheless, because of their high calorific value it is desirable owing to limitations in the size of the stomach that not less than 25 per cent. of the total calories should come from the fat.[1] Fats are carriers of the fat soluble vitamins A, D, and E, and assist in their assimilation. Furthermore, diets devoid of fat are unsatisfying.

In the case of meat the palatability of a joint depends on the level of fatness, which in turn controls the price. Beyond the optimum level of fatness the price is depressed and suet is sold for one-third the value of the fat in prime beef.[3] In the case of fish, too, the proportion of fat also seems to determine palatability; many fish contain less than 1 per cent. fat, but the more highly prized fish, such as the salmon, contain 10 per cent. or more.

The scarcity of fats arising from World War II has stimulated research into methods of increasing production. In this connexion may be mentioned the work of the Torry Research Station at Aberdeen on the extraction of herring oil which, when hardened, is suitable as an ingredient of margarine and cooking fats.

Butter Production

In the years immediately preceding 1939, it was estimated that the world butter and ghee production amounted to 4,150,000 metric tons fat equivalent annually. Viewed in this light the New Zealand annual production of the order of up to 140,000 metric tons fat equivalent is not particularly significant, but considered on a *per capita* basis there can be no doubt that New Zealand leads the world by a wide margin, and at the present time is the chief exporter of butterfat. In 1948, her exports amounted to nearly 37 per cent. of the world total.

New Zealand butter is made in 111 factories of which 90 are in the North Island, particularly in the Auckland area, where most of the butter is produced.

Because of the high value of butterfat to New Zealand, much research work has been carried out

New Zealand Government graders assessing quality of cheese for export.

on it, particularly by the Dairy Research Institute. The findings from this work have been applied to industry, so that the quality of the product is uniformly high. Butterfat is a very complex substance, and New Zealand has to compete on the United Kingdom market with countries, such as Denmark, within a few days' transport. It is, therefore, especially necessary that New Zealand butter should be of high standard and of good keeping quality.

Butter grading at Auckland.

The Grading of Tallow

Tallow and lard are obtained principally from the meat export works (of which there are 16 in the North Island and 13 in the South Island), the boiling down works, and the ham and bacon curing establishments, as well as small quantities supplied direct by farmers and from butchers.

The tallow produced may first be divided into the edible and the inedible forms. The edible variety is generally described as "first mutton," or "first beef." In the case of the edible beef and mutton tallows, however, there are some seven grades, beginning with good bright prime mixed, and ending with low and no colour gut.

The grading of the inedible fat is by no means well defined. Colour, brightness, the ease with which the colour may be removed, and unduly high fatty acid content are factors of importance. In view of the lack of chemical definition, however, it would be safe to say that the inexperienced chemist could not grade tallow, and even in the case of the experienced chemist there may be some disagreement between, say, the grading given in New Zealand, and that given by the buyer in Great Britain. The grading is important, as it affects the price.

In the case of many works the inedible grades may be reduced to two or three. Naturally, from the point of view of price, it would be desirable that all the fat from animals was made into first grade tallow. In practice, however, this is not permissible, the edible tallows in the case of lamb are produced usually from the caul fat alone, but in mutton and beef animals both caul and kidney fats are used. Furthermore, no diseased animal may legally be used in the production of edible tallow.

In the inedible grades, various classes of offal, including heads, viscera, and bones, as well as whole carcasses of condemned animals are used as sources of raw material.

Lard Production

The total world production of all slaughter fats in 1948 was estimated to be of the order of 4,850,000 metric tons, compared with the pre-war production of 5,270,000 metric tons. Accepting that the weight of lard produced is more than twice that of tallow,[4] it follows that the world tallow production in 1948 amounted to approximately 1,620,000 tons, of which New Zealand produced 47,000 tons, or approximately 2·9 per cent. New Zealand lard production is negligible, amounting to only 2,000 tons. In 1948, New Zealand ranked third as an exporter of tallow, her exports amounted to about 20 per cent. of the world total.

Selection of Processing Methods

Although obviously the method of processing affects the quality of edible tallow, the very best quality (premier jus) being produced by shredding the chilled fat and heating to a moderate temperature (50°C.), nevertheless there has been no premium of recent years for the highest possible quality of edible fat. For the most part, therefore, freezing plants in New Zealand select methods for rendering the fat which are the quickest and most economical, consistent with the manufacture of the requisite grade of product to command the top price.

Edible beef tallow is generally sufficiently stable for most purposes and is used locally for margarine manufacture, while the exported material is used in Great Britain for the preparation of cooking fats admixed with other fats, including especially suitably prepared vegetable oil. Some beef tallow is sold as refined suet, while the remainder is allocated to dripping manufacturers who pack the fat into 28 lb. or 56 lb. boxes for delivery to chip friers and bakers.

Edible mutton tallow, which, in New Zealand, is the main form of tallow, is inferior to the beef tallow, and is not generally used for local margarine manufacture. However, when the supplies of edible beef tallow are insufficient, edible mutton tallow from certain works has been used. Edible mutton tallow by itself has a high melting point and leaves a film on the tongue. It is therefore seldom, if ever, used alone as a cooking fat, but is generally admixed with other fats and oils.

Quality Control

Normally, the quality of edible tallow is controlled by determina-

Wagons of butter arriving at the grading stores.

Photos courtesy The High Commissioner for New Zealand.

tion of the free fatty acid content. If this rises above 1 per cent. it generally indicates that there has been some fault in the raw material, due particularly to delay between killing and processing. However, useful as the free fatty acid determination may be, it still gives no indication as to how long the tallow will keep before becoming rancid. For this purpose it is necessary to use some oxidation test, such as the Swift test, where air is passed through at 100°C. and the peroxide value determined at intervals. The time taken for development of appreciable peroxide value indicates the induction period, and is generally related to the storage life of the tallow.

By comparison with the highly developed butter industry it may be concluded that the production of tallow in New Zealand suffers in some instances from lack of precise technology and relative absence of fundamental knowledge. The amount of high quality product for local use is insufficient to meet even the present demands, and this impedes the development and expansion of the baking and confectionery industry. It also affects considerably the eating quality and shelf life of the product.[5]

Animal fats for edible purposes do not command the same respect as certain vegetable oils, and by not ensuring perfection in the production of edible tallows it may happen that the animal fats for edible purposes will be viewed in a still less favourable light in the future. It is the present world shortage of fats and not the quality of the animal fats that now determines their use for edible purposes.

Much fat is still retained in meat meal and fertiliser. In the case of the latter, it certainly has no value, and the possibility of the recovery of such fat by solvent extraction could well be considered.

Neatsfoot and Linseed Oil

In addition to tallow, meat export works also produce limited quantities of neatsfoot oil, which is distinct from tallow in being a liquid at ordinary temperature. Although the term neatsfoot oil is meant to apply only to the oil from beef trotters, much of the so-called neatsfoot oil in New Zealand is made from sheep's hoofs. It is produced in the usual way by wet rendering at 40 lb. per square inch. To ensure that it remains liquid, it is customary to allow the stearine in the neatsfoot oil to separate in the cold of the winter months. Although considerable quantities of neatsfoot oil are exported, there is insufficient high quality oil to meet the demands of the local woollen industry.[6]

The paint industry consumes annually about 700,000 gallons of linseed oil, which is about ·3 per cent. of the world production, a not inconsiderable quantity for a small country with less than 0·1 per cent. of the world's population.

Because of the possibility of European supplies being cut off during World War II, the British Government requested in 1940 that linen flax required for its fibre should be grown. Arising from sowing of linen flax, and the world shortage of linseed oil, operations were commenced in February, 1943, in a modern mill situated in Dunedin. The seed is crushed through a succession of rollers and then warmed in steam jacketed cookers and fed continuously to the expellers leaving about 8 per cent. oil in the cake. The latter can be sold as nuts or converted into meal.

Fish Liver Oils

Fish liver oils, though perhaps of no outstanding economic significance, have several points of interest. Firstly, the industry is based on the recovery of livers that had always been thrown overboard; and secondly, after the war, of the total of £750,000 sterling of food and other supplies which New Zealand furnished to the United Nations Children's Emergency Fund, the most valuable item was 292,000,000 capsules containing New Zealand fish liver oils.

Following the discovery that the larger edible fish in Cook Strait yielded liver oil rich in vitamin, there was produced between the years 1934 and 1938 at Island Bay some 100 to 144 gallons annually of ling liver for export to Great Britain. The oil, which was of high quality, was obtained by steaming and pressing the liver.

Due to war-time shortages it became increasingly difficult to import the normal requirements of cod liver oil amounting to some 60,000 gallons per annum, and the need for large scale local production became increasingly apparent. In Auckland in 1942, R. Greenwell established a fish liver oil factory, while in 1943 Karitane Products opened a factory in Wellington. This factory has now been taken over by Adex N.Z. Ltd. The two firms handle together practically all the readily available livers and the annual

production of fish liver oil has risen steadily.

The industry may be regarded as highly organised and very efficient. The production is checked by fully equipped laboratories.

It might be wondered how New Zealand, with an annual catch of approximately 22,000 tons of fish, can provide more than the equivalent of one-fifth of the vitamin A output of the fish liver oil produced in Great Britain with an annual catch of over 1,000,000 tons of fish. The explanation lies in the fact that the school shark contains twice as much liver oil and more than 60 times as much vitamin A, weight for weight, as does the North Sea cod, which is the main species used for oil production in Great Britain.

The estimated annual potential production of fish liver oil in New Zealand from all edible species with livers of reasonable size is of the order of only 6,000 gallons, as compared with over 30,000 gallons actual production. This indicates that most of the oil comes from non-edible species, and of these the school shark is the most important.

At first the two firms mentioned above manufactured only refined high potency fish liver oil, but with the recognition of the fact that vitamin A increased in value with concentration, the Auckland firm, working in collaboration with the Department of Scientific and Industrial Research, introduced molecular distillation late in 1946.

Difficulties facing the Industry

The New Zealand fish liver oil industry has had to face many difficulties, and the present economic picture is a complex one. Until December, 1949, 80 per cent. of the exported oil, by agreement, was sent to the British Ministry of Food at a price below world parity. At the end of the period of agreement, the productivity of the Japanese, Norwegian, and South African fish liver oil industries was having a depressing effect on the world prices; this effect became still more emphasised by the production of synthetic vitamin A.

The importance of the latter may be judged from the fact that in the United States of America at present 64 per cent. of the total vitamin A production is synthetic. On the other side of the picture the price of lemon grass oil, which is the starting point in the preparation of synthetic vitamin A, increased four times during the last year, while the sharks on which the flourishing Californian industry was based have been fished out.

Because of these latter factors and the ever increasing efficiency of the local industry, it has been possible for the New Zealand fish liver oil industry to keep going. Without scientific development this would certainly not have been the case. Perhaps the synthetic vitamin A industry is simply meant to keep prices sufficiently low to permit the survival of only the more efficient firms producing vitamin A concentrates from natural sources.

Whale Oil

The only industrial oil of aquatic origin which is produced in New Zealand in quantity is from the whale, although in earlier times seals around the islands to the south of the country were slaughtered in great numbers to provide oil. New Zealand's seal population is no longer extensive, being estimated at 20,000.[7]

Whaling has been carried out off the coast of New Zealand since the beginning of the nineteenth century. During the months of May to August the whales are caught while proceeding through the Cook Straight from the Kaikoura side. They have not been observed to pass in the opposite direction.

At the whaling station the cut up blubber is rendered in steam digesters. Both bone oil and blubber oil are produced, the bones of the animal subsequently being converted into fertiliser. It is customary to return the meat to the sea, but from 1946 until 1949, the meat, if fresh and undamaged by explosive, was canned.

The New Zealand whale oil is generally of good quality, but sometimes in former years, an occasional batch of oil has had a high free fatty acid content. This was caused by leaving the blubber in the digester before rendering. A strict control is kept and each batch is tested for its free fatty acid content, thus the oil is now of uniform high quality and should command the best world prices.

Conclusions

The present survey shows that fats and oils are the main part of the production and of the exports of New Zealand. The production of visible fats including butter, tallow, linseed oil, fish liver oil, and whale oil in 1950 amounted in weight to more than 220,000 tons, and in value to more than £48,000,000. Despite the great quantity of visible fat produced in New Zealand it is shown that the total weight of invisible fat in the meat exceeds the total weight of butterfat production. It is not easy to attach a precise value to the invisible fat, but the increasing value of meat with increasing fat content up to the level in prime beef and mutton is sufficient to emphasise that it has considerable value.

Fats are also important to local industry, especially the biscuit and confectionery, the paint and varnish, and the soap and candle industries, which together used in 1949-1950, 17,787 tons of fats costing £1,457,291 to yield products valued at £9,597,867.

The economic potentialities of fats and oils in New Zealand have probably not been fully realised. Some possible industries with considerable potentialities, including especially the whale oil industry, have not been fully developed. The economic possibilities of wool grease recovery have not been adequately explored, while many new industries based on tallow, including the manufacture of a cacao butter substitute, waxes and many other products, should be feasible.

In the development of new industries based on technological advances, it is usually in the early stages that most profits are made. A classical example of this in connexion with the fatty oils is their hardening by means of hydrogen-

ation. Another instance of local significance is the early application of molecular distillation to produce vitamin A concentrates from fish liver oils. Because of the economic advantages in the early stages of development of new processes, as well as the fact that a rapid change in demand might happen, as with wool grease, it is desirable for New Zealand to remain in the forefront of technological development and of fundamental knowledge of her main export constituent—the fats.

Fats and oils have a varying significance in different countries, but nowhere is their economic significance so great as in New Zealand, where the annual production of fats and oils of one-tenth of a ton *per capita* is more than three times that of the United States of America, or in absolute terms, excluding whale oil, nearly two and a half times that of the United Kingdom.[8]

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Information regarding the amounts and values of the New Zealand production has been supplied through the courtesy of the New Zealand Census and Statistics Department.

FUTURE ARTICLES

The February issue of FOOD MANUFACTURE will contain a special section devoted to Packaging. Among other items will be articles on "Transport and the Food Industry," Part I, by Graham Saville, and "Bacteriological Examination of Canned Hams," by R. Buttiaux.

Mineral Sediment in Condensed Milks

THE white crystalline material which forms in some sweetened condensed milks, becoming apparent mainly, after reconstitution, as a white deposit, consists essentially of tricalcium citrate. The rate of formation of the crystals increases with the storage temperature. With refrigerated storage, development of sediment is negligible. Photo-micrographs of the sediment and of the insoluble residue show the needle-like nature of the crystals in rosette cluster form. Analysis of samples of raw and condensed milk have revealed no relationship between calcium, citrate, or total solids content, and the extent of sediment formation. Sediment formation was usually most apparent in those samples in which lactose crystallisation was relatively coarse.

According to A. J. Lawrence, C.S.I.R.O. (*The Australian Journal of Dairy Technology*, April-June, 1952), it has been noticed that some samples of Australian sweetened condensed milks contain an insoluble crystalline sediment which shows up as a white deposit when the milk is reconstituted with water. This defect is at times a source of commercial difficulty. Investigations were therefore undertaken to establish the chemical nature of the deposit, to determine whether its occurrence in Australian sweetened condensed milks could be correlated with variations in the chemical composition of the milk, and to study the effect of such measures for its alleviation as the use of lower pre-shipment storage temperatures.

The deposit was isolated from sweetened condensed milk and analysed. It contained:

	per cent.
Citric acid	60·18
Phosphate (P_2O_5) ..	0·36
Carbonate (CO_3) ..	0·36
Protein (N×6·38) ..	4·17
Calcium (Ca)	19·78
Magnesium (Mg) ..	1·73
Sulphate (SO_4)	absent

Samples of canned sweetened condensed milks were obtained from three factories in Victoria, one in South Australia, and one in Western Australia. Samples were drawn from the one batch at each factory during the late January-early February period of 1949 and it was arranged with one company to continue to supply samples, at regular monthly intervals, from a batch of sweetened condensed milk, together with the corresponding raw milk. The sample cans were subjected to three different conditions of storage:

(*a*) Refrigerator storage — average temperature 5°C.
(*b*) Room temperature storage—average temperature 20°C.
(*c*) Incubator storage—average temperature 37°C.

At intervals, cans were drawn from storage and the amount of sediment estimated. All but 50 g. of the milk was removed from the can. This 50 g. was well mixed and dissolved in 150 ml. of hot water (160°F.) and centrifuged at 1,000 r.p.m. for a quarter of an hour. The upper layer was then drawn off and the sediment treated with a further 200 ml. of hot water and another centrifuging operation for a quarter of an hour. After removing the upper liquid layer, the sediment was transferred to a glass evaporating basin, dried at 100°C., and weighed when cool.

The storage tests show clearly that maintenance of as low a storage temperature as possible for sweetened condensed milk is one of the methods which may be adopted to minimise mineral sediment formation.

The wide variation in the susceptibility of different samples of condensed milk to this defect is not due to differences in their calcium or citrate contents. Sharp differences in the susceptibility of milks from day to day, as well as between the various factories, suggests that some unrecognised factor in the manufacturing process must be associated with the sediment formation. The tendency, revealed by the microscopic examination, for the defect to be most pronounced in milks in which the lactose has been coarsely crystallised, also suggests an association with manufacturing methods.

The Milling Industry

Progress in 1952

A. J. Amos, Ph.D., B.Sc., F.R.I.C.

The dietary value of a food is governed by two factors. It must, of course, be related to the nutrient content of the food but it depends also upon the amount of the food that is consumed. A food of relatively high nutritive level may be of little value to a community if it is eaten in only small amounts; conversely, a food which ranks only as moderate in the eyes of the nutritionists may play an important role in the diet because it is widely eaten and in considerable amounts.

BREAD is a staple foodstuff of this country and is able to contribute not only calories but also a not insignificant proportion of the daily requirements of protein in a form of good biological value. It is, therefore, desirable that we should make the best use of the potential dietary value of bread by maintaining bread consumption at a high level. This can be accomplished only if bread generally reaches a high standard of quality. If it is well fermented and well baked, so that it has good eye and palate appeal, then it will be consumed in considerable quantity and will be able to supply us not only with a valuable amount of carbohydrate but also with well over one-third of our protein requirements and will serve also as a useful source of some of the B vitamins.

Main Requirements for Good Bread

Bread of first-class quality can be produced only if miller and baker perform their tasks well. The fact that a miller makes good flour does not ensure that it will be converted into good bread; bad bread can be produced from the best flour, if the bakery technique is not properly performed. On the other hand, not even the best baker using the most modern equipment can produce good bread from unsatisfactory flour. It is, therefore, of the utmost importance that the miller should produce flour which will yield bread of high quality if properly treated in the bakery. The production of such flour is the first step toward reaching and maintaining a good standard of nutrition throughout the nation.

If a miller is to produce flour capable of yielding first-class bread he has to meet two requirements. He must maintain a mechanically suitable plant and operate this efficiently; in addition he must send to that plant a blend of wheats which, if properly milled, will give him a flour with satisfactory characteristics. Hence, one of the initial steps in maintaining a satisfactory standard of nutrition throughout the country at the present time is the provision to the milling industry of suitable wheat for the production of good bread flour. This is still the task of the Ministry of Food, because bulk buying of wheat remains in force.

Unfortunately, the question of dollar expenditure comes into the picture, and often lower grade and cheaper wheats are bought, with the result that the blends imposed upon the millers are not necessarily those which would be employed were the industry purchasing its own wheats. Nevertheless, it is true to say that despite these handicaps the industry has done very well and bearing in mind that it has had to extract 81 per cent. of flour from a grist containing no high grade Manitoban, the quality of the bread has remained at a noteworthy high level.

Gas Production in Bread Doughs

Two main phenomena are involved in breadmaking, namely, gas production within the dough and gas retention by the dough. Each of these factors is, in the first place, under the control of the miller. The amount of gas produced within a dough and the rate at which it is produced depend upon the proportion of yeast employed by the baker and the quantity of sugar available to the yeast. In the early stages of fermentation the sugars natural to the flour serve the yeast, but in the later stages of the process the yeast has to rely upon the reserve supply of sugar that has been built up by the diastatic enzymes of the flour acting on the starch. Hence, in order to produce a satisfactory breadmaking flour, the miller must ensure that when his wheats are blended due account is taken of their relative diastatic activities.

Assessment of Diastatic Activities

The relative diastatic activities of flours cannot be assessed by applying to them the well-known Lintner procedure. Lintner figures furnished by baking flours bear no relation to their sugar-producing ability in a dough. The reason is that in a dough the enzymes of the flour have to use as their substrate not the soluble starch of the Lintner test but the starch of the flour from which the dough is made. The diastatic activity of a flour is, therefore, evaluated by measuring the proportion of sugar which is produced under fixed and controlled conditions of time and temperature by the action of the diastatic enzymes of the flour upon the starch of that flour. The figures thus obtained are known as "maltose figures."

Evaluation of Wheat Protein

The ability of a dough to retain gas produced within it is determined by the physical nature of the wheat protein. This must be sufficiently strong to withstand the pressure of the gas but at the same time must be sufficiently distensible to expand under the pressure of this gas without rupturing during the early stages of baking. Hence, the nature of the wheat protein is another factor to which the miller must give attention

when compounding his wheat blend. Quantity of protein is also important because even if the quality of its protein is satisfactory, a flour will not possess good baking properties if the quantity of that protein which is present is too low.

In view of these considerations it is necessary for millers to know in advance the protein content, the protein quality, and the diastatic activity of each of the wheats that is available to them for use in their blends. It is customary, therefore, for millers to arrange, either through their own laboratory, where this exists, or in other instances through consultants, to have each wheat allocated to them analysed and tested physically before use, and preferably before arrival at the mill.

The evaluation of protein quality is performed by the use of sensitive instruments specially designed for testing and recording the rheological properties of dough. Several such instruments are available but the author employs the Alveograph, and all the figures for the physical properties of wheat protein quoted in this review will have been obtained by means of this instrument.

Type of Wheat Required

As only about 30 per cent. of wheat requirements is produced in Britain, the bulk of the wheat called for by our needs for flour has to be imported. The wheat grown in England is very weak, *i.e.* has a weak protein, and is quite unsuitable on its own for breadmaking. Because of this, much of the wheat we import is of the opposite type, that is, a strong and proteinous wheat, so that when blended with our native wheat a flour of medium strength suitable for the baking industry of this country can be obtained.

In addition, some wheats of medium strength are imported. These are generally known to the British miller as "filler" wheats. In general, therefore, a miller's blend will consist of a suitably balanced mixture of strong Canadian wheat and weak English wheat admixed with a proportion of filler wheat, *i.e.* wheat giving a flour of strength similar to the Manitoban/English mixture.

Millers also produce flour for purposes other than breadmaking, such as cake making and biscuit making, for which a different wheat blend is needed. Flour for cakes and for domestic use needs to be weaker and less proteinous than breadmaking flour, and in such blends the miller uses quite a high proportion of weak English wheat and often some imported weak wheat such as, for example, Australian.

Biscuit flour is weaker still and it is customary to produce this by milling English wheat only, preferably the weakest type of English wheat.

Canadian Wheat

During 1952 about 90 per cent. of the imports of Manitoban wheat was represented by grade Nos. 3 and 4. It is fortunate, as will be illustrated later, that the properties of the protein of these grades were significantly superior to what they have been in some seasons, so that the breadmaking quality of the flour suffered less than it might have done in other years. On the other hand, these wheats are thinner than the better grades, and from this angle the purchase by the Ministry of Food of 3's and 4's placed a further hardship upon the miller; his task was rendered even more difficult in that it was less easy to obtain 81 per cent. of flour from the grain and at the same time maintain a reasonable colour.

The Regulations of the Canada Wheat Act make provision for what is called a "Tough" grade, when the moisture content of the wheat exceeds 14 per cent. A considerable proportion of the crop which came forward in 1952 was of this variety and no less than 50 per cent. of the imported No. 3 grade wheat had been graded as Tough, while the proportion in the case of the No. 4 grade importations was one-third.

The overall mean data for each of the Manitoban grades imported during 1952 are shown in Table I.

These data reveal that there has not been a great deal to choose between the No. 3 and No. 4 grade wheats, either Atlantic or Tough, from the points of view of protein content, protein quality, and diastatic activity. Each type has represented a wheat of useful strength and satisfactory protein content and diastatic activity which has been capable of carrying a reasonable proportion of weaker wheat in the blend. The Vancouver No. 4's have been slightly less proteinous and a trifle weaker than the others but this inferiority of the Vancouver compared with the Atlantic wheats is quite usual.

Another Canadian wheat which was imported during the year was Garnet. This wheat is graded separately because its protein characteristics are significantly different from those of Manitoban wheat. Its protein is rather stiff and only moderately elastic compared with that of Manitoban, and if the wheat is used too freely in the blend, the resulting flour furnishes a rather stiff and somewhat sluggish dough. These tendencies are revealed by the mean figures for the importation of Garnet during 1952, which show less strength than Manitoban wheat but rather greater stability.

Another noteworthy feature is the protein content which is more than one unit per cent. below that of most Manitoban wheats. The average data for 1952 for Garnet wheat arrivals were: protein 11·75 per cent.; maltose figure 1·71; stability 115; strength 57.

U.S.A. Wheat

Two varieties of wheat imported from the U.S.A. during the year were Northern Spring and Hard

TABLE I

MEAN DATA FOR IMPORTATIONS OF MANITOBAN WHEAT DURING 1952

Grade of Wheat	*Protein Content per cent.*	*Maltose Figure*	*Stability*	*Strength*
No. 3 Atlantic	13·03	1·63	107	72
No. 3 Tough	13·00	1·61	102	72
No. 4 Atlantic	13·10	1·74	112	69
No. 4 Tough	13·07	1·71	107	76
No. 4 Vancouver	12·70	1·77	111	64

Winter. The former is a strong wheat, although not up to the standard of most Manitoban in this respect. Nevertheless, it is sufficiently strong to carry weaker wheats. The protein is satisfactorily balanced and the protein content is reasonably good. The mean data for 1952 were: protein 12·50 per cent.; maltose figure 1·74; stability 85; strength 60.

The Hard Winters fall into a different category from the miller's point of view; they are not strong enough to carry weaker wheat but serve as useful "fillers." There is a tendency for some of them to show a slight stiffness and deadness in the protein, but this is not unduly marked. They have quite a useful protein content, but this is not quite as high as that of the Northern Spring. The mean data for the Hard Winters received during 1952 were: protein content 11·90 per cent.; maltose figure 1·37; stability 73; strength 49.

Russian Wheat

A number of consignments of Russian wheat were received during the year under review. These were very similar in data and did not exhibit the wide spread that has been characteristic of imported Russian wheat in some past years. The type of Russian wheat received during 1952 did not warrant its being regarded as a filler wheat; it was stronger than English wheat and stronger than the imported Australian, but it nevertheless required support from the strong group of the blend. The protein content was good and fully up to the level of that of Manitoban. The arrivals during 1952 gave the following mean data: protein content 13·20 per cent.; maltose figure 1·43; stability 62; strength 37.

In some pre-war seasons arrivals of Russian wheat were sometimes badly damaged by wheat bug attack and their use in the blend in other than a small proportion had a seriously deleterious effect upon the flour. The flour furnished by bug-damaged wheat is rich in proteolytic enzymes and the dough which it yields softens rapidly and may become too soft and distensible to handle. Some of the 1952 arrivals of Russian wheat showed evidence of wheat bug attack but fortunately the damage was slight. Blends containing as much as 15 per cent. of these Russian wheats furnished flour which behaved satisfactorily, and in no instance were difficulties encountered from excessive proteolytic activity in the dough.

Australian Wheat

Australian wheat was imported quite freely during the year. This wheat has a low protein content and the protein is weak. It is possible to grow proteinous and very strong wheat in Australia, but such wheat is kept for home consumption and it is only the weak type that is exported. Although imported Australian wheat can rank only as a member of the weak group in a breadmaking grist, it is a useful wheat in blends intended for the production of flour for purposes other than breadmaking, *e.g.* for domestic use and for conversion into self-raising flour. The arrivals in 1952 gave the following mean data: protein content 9·45 per cent.; maltose figure 1·54; stability 69; strength 27.

English and Irish Wheats

The English wheat grown during 1952 showed the usual wide range of strength and stability. The reason for this is that a large number of different varieties of wheat are grown in Britain and the variation in soil between different parts of the country is considerable. There is, of course, no grading system. The range in strength covered Alveographe figures between 8 and 47. The average data for the samples examined in the author's laboratory during 1952 were: protein content 9·07 per cent.; maltose figure 1·46; stability 56; strength 27. Comparison of these figures with the mean data for the Australian arrivals reveals that these two types of wheat were on a par with respect to strength during 1952 but that the Australian had rather the greater stability, which meant that its protein was rather less distensible.

A number of Irish wheats was received in the author's laboratory during 1952. Ireland does not export wheat, but the samples received represent the type of wheat available to the miller in that country. The mean data for the samples received during 1952 show that the Irish wheat was significantly stronger, more stable, and more proteinous than the English wheat. The 1952 mean figures were: protein content 10·08 per cent.; maltose figure 1·70; stability 90; strength 38.

Wheat Grists

The blend of wheats to be used by the miller when making breadmaking flour continues to be prescribed by the Cereals Division of the Ministry of Food. Usually the regulations concerning the wheat grist, which are liable to revision each month, quote maximum figures for Manitoban wheat, minimum figures for home-grown wheat, and a maximum for Australian and/or American White Wheat.

The maximum and minimum figures quoted vary with the wheat position. As the British crop year advances and supplies of native wheat gradually dry up, the minimum proportion of this type required in the grist is reduced, while the permitted maximum for Manitoban is raised. As the new crop English wheat becomes available after the next harvest the amount of this wheat required in the blend increases. Thus, during 1952 the amount of English wheat in the official grist dropped from a minimum of 25 per cent. in January to a maximum of 10 per cent. in July.

In August, however, when some native wheat had been harvested, the proportion required in the blend rose to a minimum of 35 per cent. The proportion in which Manitoban wheat was required to be used varied throughout the year from a maximum of 45 per cent. to a maximum of 70 per cent. The maximum amount of Australian and/or American White Wheat permitted varied from 5 per cent. to 15 per cent.

The regulations relating to wheat grists apply only to blends intended for the production of breadmaking flour. Flour intended for purposes other than breadmaking, which is officially known as "M"

flour, does not have to be made from a prescribed grist. Thus, flour intended for domestic use or for conversion to self-raising flour can be made from whatever blend a miller chooses. Similarly, flour for biscuits is usually made from a grist consisting of all English wheat.

It might be assumed that as breadmaking grists are more or less standard throughout the country all breadmaking flour would be identical. This, of course, is not so because there is appreciable variation between the extremes of any one type of wheat. Even individual consignments of graded Manitoban wheat show significant differences in protein content and strength and the "spread" is much more marked in ungraded wheats and in weak wheats such as English. An idea of the range in data which can be encountered for a given type of wheat can be provided by the minimum and maximum figures furnished by No. 3 Manitoban and by English wheat received in one month of 1952 in the author's laboratory. These data were as given in Table II.

Additions to Flour

The obligatory addition to breadmaking flour of *creta praeparata*, a practice introduced during the war, continues. Although the extraction is now 81 per cent., no change has been made in the proportion in which the *creta* has to be added and each 280 lb. of breadmaking flour still has to contain 14 oz. of this chemical.

Imported flour has to be mixed with home-milled flour and the supposed effect of this added flour, which is of lower extraction than home-milled flour, is to bring the overall extraction of the mixture down to 80 per cent. The proportion of imported flour which millers had to add during 1952 varied from 7·5 to 12·5 per cent. in England and to 15 per cent. in Scotland and Northern Ireland. During part of 1952 special home-milled flour had to be added to a normal run as well as imported flour.

Milling Difficulties

The technological difficulties facing the miller in 1952 were not inconsiderable; he was forced to mill to an extraction of 81 per cent. and yet often he was provided with no wheat better than Tough No. 3 Manitoban. These lower grade wheats are thinner than the top grades and yield less flour, and in order to maintain his extraction, the miller was inclined to send his wheats to the mill in a fairly dry condition.

When a blend is milled too dry the flour is liable to yield a dough which is not sufficiently springy and pleasing; this is particularly unfortunate when the blend contains a high proportion of No. 3 or No. 4 Manitoban, since the proteins of these grades are already inclined to be somewhat stiff and lacking in spring. During 1952 a number of flours was encountered which gave rather dead and sluggish doughs and which, therefore, produced loaves below par in volume, and in most instances the use of rather more moisture in the wheat blend led to a decided improvement in dough characteristics.

Any tendency to deadness and lack of liveliness in the protein of a flour is accentuated if the wheat from which it is produced receives too much heat treatment, *i.e.* is conditioned at too high a temperature or for too long a time. The grists in use in 1952 were, therefore, best conditioned at a temperature not exceeding 110°F., and preferably at 100° to 105°F. Adherence to these limits was particularly desirable during the summer months, when the temperature of the cooling air could have been in the region of 80°F.

TABLE II

	Protein per cent.	*Maltose Figure*	*Stability*	*Strength*
No. 3 Manitoban				
Minimum	12·20	1·10	87	62
Maximum	14·31	2·00	128	85
English Wheat				
Minimum	6·91	1·00	20	9
Maximum	11·46	2·15	77	42

The Chemical Treatment of Flour

The scare that followed Mellanby's discovery that Agene-treated flour gave dogs hysteria has died a natural death, despite the distorted publicity which Agene received in some quarters, and the bulk of the flour of this country continues to be treated with nitrogen trichloride. In view of the adverse publicity which bread received as a result of Mellanby's work it is probably wise to adhere to the decision to dispense with the use of Agene, although evidence which has accumulated would suggest that the continued consumption of bread made from Agenised flour would have no ill effects upon humans.

Work reported at the end of 1951 but too late to be included in the review of that year presented some interesting and enlightening facts relating to the toxicity of methionine sulphoximine, the canine hysteria-producing compound which Agene produces when it acts upon flour. The rat and monkey are about 100 times more resistant to methionine sulphoximine than is the dog, which is particularly sensitive to this compound, and existing evidence would suggest that man's resistance is at least equal, and probably superior, to that of the monkey.

Experiments have shown that 250 mg. of methionine sulphoximine per kilogram of body weight are needed to produce the slightest symptoms of toxicity in the monkey, and man, therefore, requires at least this dosage if he is to suffer ill effects. Hence, a 12-stone man would require a dose of no less than 19,000 mg. of methionine sulphoximine before harmful effects could be realised. The consumption of 1 lb. of flour exhaustively treated with Agene would provide less than 70 mg. of methionine sulphoximine!

Protective Effect of Methionine

Another factor of importance is that the harmful effects of methionine sulphoximine can be prevented if methionine is fed with the methionine sulphoximine. In the case of the monkey, complete protection against an otherwise

toxic dose of methionine sulphoximine can be attained by feeding about 10 times as much methionine. When flour is exhaustively treated with Agene only 5 per cent. of the methionine is converted into methionine sulphoximine, so that when Agene-treated flour is consumed the methionine sulphoximine ingested is accompanied by almost 20 times as much methionine. Hence, as far as man is concerned the consumption of 1 lb. of fully Agenised flour provides only about 1/250th of the methionine sulphoximine required to produce harmful effects, and at the same time furnishes nearly 20 times as much of the protective methionine. These facts explain why the feeding of large amounts of highly Agenised flour to humans, including some epileptics, for over seven months caused no ill effects.

Chlorine Dioxide as an Improver

The Committee appointed by the Ministry of Food under the chairmanship of Sir Wilson Jameson to report upon flour treatment advised the use of chlorine dioxide as an alternative to Agene, the discontinuance of which it recommended. It has not yet been possible to provide the equipment necessary for a complete change-over from Agene to chlorine dioxide, but plants for treating flour with the latter compound are being installed in mills. This plant, which relies upon the interaction of gaseous chlorine and a solution of sodium chlorite for the production of chlorine dioxide, is very efficient and capable of being closely controlled.

Some slight concern has been expressed in some quarters about the presence in the chlorine dioxide of a small proportion of chlorine. There are certainly no logical grounds for such concern. The amount of chlorine in the chlorine dioxide does not exceed 20 per cent., and at a full dosage of chlorine dioxide the amount of chlorine added to the flour would amount to the small quantity of 1 g. per sack of 280 lb.

When some years ago chlorine was used as a flour improver, it was employed in the proportion not of 1 g. but of 56 g. per sack! Feeding trials with flour treated with chlorine at this higher level have failed to produce any evidence that the flour is in any way harmful—how then can it be suggested that the presence in flour of only eight parts per million of chlorine is cause for perturbation? Even if the direct use of chlorine as an improver were prohibited, it is most unlikely that exception would be taken to the very small amount of chlorine which may get into flour treated with chlorine dioxide.

Natural Flour Improvers

Over ten years ago the Director of the Wheat Institute of New Zealand reported that the deleterious effect of germ upon baking quality was due to glutathione. He found, however, that if germ were fermented before being added to a flour, it no longer had a detrimental effect but even acted as an improver. Eight or nine years later a Swiss chemist reported that the inactivation of the glutathione was due to its reaction with either or both of two substances produced during the fermentation. He was not, however, able to identify these reactive substances. The problem was investigated by the Research Association of British Flour-Millers during 1952 and both compounds were isolated and identified. They proved to be methoxy-p-benzoquinone and 2:6 dimethoxy-p-benzoquinone.

As had been anticipated, these substances had an improving action upon flour and they also proved to be flour bleachers. The discovery of these naturally occurring flour - bleacher - improvers opens up a new and suggestive field of thought. However strong might become the antagonism to the use of chemicals in food, little objection could be made logically to the addition of a substance which occurred naturally in that food. Neither methoxy-p-benzoquinone nor 2:6 dimethoxy-p-benzoquinone could, however, be used commercially as flour improvers, because each of them causes the crumb of the bread to assume a pink colour.

The possibility exists, however, that there may be other naturally occurring compounds which can act as improvers or bleachers without producing undesirable side effects, since benzoquinone, the parent substance to the methoxyquinones, has an improving action on flour and does not turn the bread pink. It is not unlikely that the discovery that these naturally occurring methoxyquinones have an improving action upon flour may lead to new light being shed on the mechanism of flour improvement.

Microbiological Spoilage of Bread

Spoilage of bread by moulds has tended to increase since the introduction of wrapped bread. This result is perhaps not unexpected since, particularly if the bread is not completely cooled before it is wrapped, the air enclosed within the wrapper may attain a relative humidity sufficiently high to favour the growth of moulds. It is true that loaves leaving the oven contain no living mould spores on their surface but unless special precautions are taken, they become contaminated with air-borne spores during cooling. This contamination occurs with most bread but so often wrapped bread provides more favourable conditions for the growth of the mould fragments.

Mould growth on bread can be prevented by including in the dough 0·1 to 0·3 per cent. of calcium propionate. The use of this compound as a mould preventative is permitted in America. It would not, however, be possible to employ calcium propionate in National bread because it is not included in the list of substances which may be used in such bread, as outlined in the Bread Order.

Whether calcium propionate could be used in bread other than National bread is arguable. It has been suggested that its use would be ruled out under the Preservatives Order. It is doubtful, however, whether the prevention of mould growth on bread can be said to be "inhibiting, retarding, or arresting the process of fermentation, acidification, or other decomposition of food or masking any of the evidences of putrefaction."

If it were held that the action of

calcium propionate in preventing the growth of mould was covered by the above definition, then the use of acetic acid to arrest the development of rope in bread would certainly also be ruled out by the Order. There has certainly been no suggestion that the use of acetic acid as a rope inhibitor contravenes the regulations for the use of preservatives!

This question is a matter for concern because as the use of wrapped bread increases, it may well be necessary to give consideration to the use of a mould preventative if serious wastage of bread is to be avoided during the hot summer months.

Physical Properties of Dough

Accumulated experimental evidence establishes that the physical properties of dough are closely bound up with the manner in which contiguous polypeptide chains of the flour protein are united by cross links. There is also evidence to support the theory that chemical improvers act by creating new cross linkages, as, for example, by joining an SH-containing side chain of a polypeptide molecule to a similar side chain on an adjacent polypeptide molecule by converting the two SH groups into an -S-S- group. Obviously, if the number of cross linkages between adjacent polypeptide chains is increased, the ease with which and the extent to which these chains can be moved relative to one another will be diminished, and the protein will, therefore, exhibit greater toughness and less extensibility.

As yet, however, our knowledge of this relationship between protein structure and protein properties in relation to flour protein is comparatively meagre, and there is great scope for research on the problem. Continued investigation in this field is desirable not only to answer all our queries about the mechanism of improver action but also because it may lead to technological developments which will enable us to control and to utilise the physical properties of dough to better advantage.

Some interesting progress was made in this field during 1952 in an investigation in which the binding of anionic compounds with the proteins of flour was studied. It was found that surface-active detergents of the anionic type added to flour in proportions between 0·1 per cent. and 1·0 per cent. altered considerably the properties of the protein in the direction of increased toughness and strength. Cationic and non-ionic surface-active agents had little effect on dough properties.

The mechanism of the interaction between the flour proteins and the anionic surface-active agents is not fully understood but these detergents promise to be a valuable tool in the investigation of the problems associated with the cross linking of the peptide chains.

Contamination of Milled Products

It is some years ago now since regulations were introduced in U.S.A. relating to the numbers of rodent hairs and insect fragments in various foodstuffs. The imposition of these regulations had repercussions in Britain, since cereal foods exported to America had to comply with the standards. Rodent hairs and insect fragments are not harmful in themselves, but their occurrence to an excessive extent in a foodstuff is an indication of a more serious microbiological contamination arising from the presence of faecal matter, and of unsatisfactory hygiene and bad "housekeeping."

The contamination with rodent faecal matter arises from the presence of rodent faecal pellets in the wheat. The size, shape, and specific gravity of wheat are so similar to those of mouse droppings that the extraction of the pellets is a difficult task. Indeed, under the conditions existing at the present time in Britain, namely, a compulsory extraction rate of 81 per cent. on wheat as received, it would be impossible to extract all the faecal pellets from a contaminated wheat and at the same time comply with the regulation.

If strict standards for rodent hairs were contemplated it would, therefore, be necessary to deal with the problem at an earlier stage and to ensure that the faecal pellets had been removed before the wheat reached the mill. The magnitude of this problem would depend upon the extent to which the home-grown wheat crop is contaminated with rodent faecal pellets.

A survey of the situation in Britain has not been recorded but the problem of the contamination of wheat by rodent pellets and by insects was investigated in the U.S.A. in 1952. Of a total of 1,410 wheats examined, only about 40 per cent. were free from both faecal pellets and insects. Rodent pellets were present in 23 per cent. of the wheats and the average faecal pellet count in these contaminated wheats was two pellets per 100 g. of wheat. Insects were present in 52 per cent. of the samples and the average insect content of these contaminated wheats was 7·7 insects per 100 g. of wheat.

Unless the conditions are significantly better in Britain, and there is no reason to expect that they are, the introduction of strict limits for these two types of contamination would, under present conditions, make it necessary for the miller to subject a considerable proportion of at least his home-grown wheat to special treatments for the eradication of rodent faecal pellets and insects.

Detecting Invisible Dirt

ATOMIC energy is being used by the National Sanitation Foundation, U.S.A., to show up invisible dirt and bacteria remaining on clothing and dishes after washing. It is expected that the new development will be useful to manufacturers and consumers in determining which washing process, detergent, or machines do the best job under given conditions, and which surfaces are the easiest to clean.

In this method, clothing, eating utensils, or other materials are soiled with specific quantities of dirt and bacteria that have been made radioactive. On exposure to X-ray film after washing, any dirt and bacteria remaining are registered on the film. Measurements are reported to be 98 per cent. accurate.

News from the Industry

FORTHCOMING EVENTS

The Nutrition Society

A conference on "The Psychology of Eating and Nervous Disturbances of Nutrition" is to be held at Aberdeen University on Saturday, January 31.

Society of Public Analysts

A meeting organised by the Physical Methods Group of the Society of Public Analysts and Other Analytical Chemists is to be held on January 30 at Birmingham, the subject of which will be "Qualitative and Quantitative Chromatography."

The Royal Society of Arts

The following meetings have been arranged for January by the Royal Society of Arts:

Jan. 14. "Fuel Economy," by W. E. P. Johnson.
Jan. 21. "Plant Hormones," by Prof. S. C. Harland.

The Institute of Meat

Two meetings have been arranged for January by the Institute of Meat:

Jan. 13. "The Need for Improvement in Slaughterhouse Methods," by H. E. Bywater. To be held at the National College of Food Technology at 5.30 p.m.
Jan. 20. "The Freezing, Chilling, and Cold Storage of Meat," by Dr. E. C. Bate-Smith and Putnam Eaton, to be held at 5.30 p.m. at the Institution of Mechanical Engineers. A joint meeting arranged by the Institute of Refrigeration.

Management in Industry

A special course of 10 lectures, to be given by Mr. T. H. Munro, has been arranged by the Department of Food Technology of the Borough Polytechnic, beginning on Wednesday, January 14, at 6.30 p.m., as follows:

Jan. 14. Introduction: The Problems of Management.
Jan. 21. Finance: How to Finance a Business; Sole Owner; Partnerships; Limited Companies.
Jan. 28. Accountancy: How Bookkeeping Works; Modern Accounting Methods.
Feb. 4. Selling and Customer Relations.
Feb. 11. Advertising and Market Research.
Feb. 18. Purchasing and Stock Control.
Feb. 25. Personnel Management: How to get the Best out of Employees; Welfare; Wages Methods; P.A.Y.E.; Pension Schemes; Sickness Insurance; Profit Sharing.
Mar. 4. Accountancy (contd.): Income Tax; Purchase Tax; Trading and Profit and Loss Accounts; Balance Sheets; Depreciation; Wear and Tear.
Mar. 11. Statistics: How to use them; Costing Records.
Mar. 18. Final Summary and Question Time.

The fee of £1 1s. for the course is payable on the opening night.

Society of Chemical Industry

The January meetings of the Food Group of the Society of Chemical Industry are as follows.

Jan. 21. "The Preservation of Natural Colours and Flavours in Food," by Dr. V. L. S. Charley. A joint meeting with the Birmingham section, to be held at Birmingham.
Jan. 28. "Food and the Future. 2. Present Methods of Attack on the Problem," by Dr. G. A. C. Herklots and Prof. J. Yudkin. A Nutrition Panel meeting, to be held in London.

The Microbiology Group of the Society have arranged the following meeting for January:

Jan. 14. "Symposium on Recent Advances in Microbiological Methods." Papers will be contributed by Prof. M. Stacey, Dr. E. Windle Taylor, Dr. L. A. Allen, Dr. S. T. Cowan, and Mr. J. Tramer. A joint meeting with the Society for Applied Bacteriology, to be held at 2.15 p.m. at the Institution of Civil Engineers.

OBITUARY

Mr. Montgomery St. Alphonse, in Montreal, on November 23, director of W. J. Bush and Co. (Canada).

Mr. St. Alphonse, who was a grandson of the founder, had given 50 years' notable and distinguished service to the company.

Mr. Montgomery St. Alphonse.

Since 1920 he had assumed, as Treasurer, responsibility for the general management of the Canadian Company, and in 1942 he was appointed a director of the parent company and of Bush Incorporated.

Capt. William Frank Cooper, chairman and managing director of Frank Cooper, Ltd., the Oxford marmalade manufacturers, at the age of 77.

Mr. Eric Bradburn Read, chairman of Reads, on November 26, at the age of 53.

The son of Mr. William Arthur Read, Mr. Read was educated at the Leas School, Hoylake, and subsequently at Marlborough College. He was called up towards the end of World War I, and served as a Captain in the Royal Artillery. At the conclusion of the war he was in the Army of Occupation in Germany for some time. Shortly after he left the Army, he joined the company, which was founded by his grandfather, Mr. Robert Read, in 1869.

More Price Reductions

The prices of all grades of Bisol acetic acid have been reduced with effect from December 1.

The revised prices, which take effect on all despatches made on or after that date, are as follows:

	per ton
Glacial B.P.	£111
Glacial 99-100%	£108
Glacial 98-100%	£105
80% Pure	£102
80% Technical	£96

All prices quoted are for 10 tons spot or contract.

British Industrial Solvents have also reduced the price of Bisoflex 81 (their dioctyl phthalate plasticiser) by 3d. per lb., reduction to take effect on all despatches made on or after December 1.

The new price schedule for this product is as follows:

	per lb.
10 tons spot or contract	2s. 10d.
5 tons ,, ,, ,,	2s. 10¼d.
1 ton ,, ,, ,,	2s. 10½d.
45 gallon drum ..	2s. 11½d.
10 gallon can	3s. 1½d.
5 gallon can	3s. 2½d.

All prices are carriage paid, in returnable packages.

"Topsy" obtains Diploma

The lollies manufactured by Frozen Confections have recently been awarded the diploma of the Good Housekeeping Institute.

A new wrapping machine for 1 lb. raised meat pies has been installed in Wall's Willesden factory. It wraps pies at the rate of 24 per minute.

Meat Products by the Ton

An average weekly output of half a million pounds of sausages and 85 tons of pies is achieved in Wall's new sausage, pie, and meat products factory which is now in full production. This factory was fully described in FOOD MANUFACTURE, 26, 8, 305.

Fluorescent Lighting

The cold cathode form of fluorescent lighting has many advantages over the more common hot cathode type, the principal ones being the very much greater length of life of the lamps, and the freedom from flicker and other troubles associated with starter switches and low supply voltages. Cold cathode lighting responds immediately without flicker when switched on, even if the supply voltage is reduced to about half its normal value.

Self-contained units can be supplied by the manufacturers, Ionlite, or the lamps can be shaped to conform to architectural features, or supplied in almost any design or length. This latter facility makes it the ideal form of lighting for new premises, or for those in which the lighting is really considered part of the general scheme.

Where it is important that food or materials for display should look attractive under artificial light, cold cathode lighting, with its wide range of colour variation, provides the most suitable light source.

Retirement

At a meeting of the Board of Directors of Monsanto Chemicals, it was announced that Mr. A. D. Daysh, director of the company, would be retiring with effect from January 31, 1953. Mr. D. R. Mackie, general manager of sales, was appointed to the Board as an additional director.

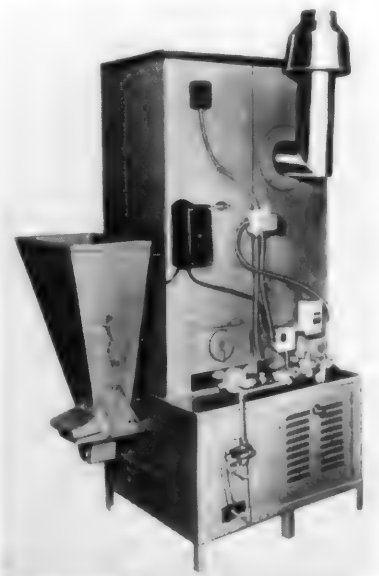
Charles Henry Foyle Trust

Details of the donations and grants made by the Charles Henry Foyle Trust for the 12 months ended May 31, 1952, are given in the eleventh annual report.

Change of Name

As it has become apparent that the name of their company has been giving the impression that the foodstuffs manufactured are composed, in the main, of soya and since they consist primarily of milk powder, Soya and Protein Products, Ltd., have arranged to change their name to Milk and Protein Products, Ltd.

The company also announce that the price of their Neolac milk substitute has been reduced and that they have introduced a vegetable albumen under the name of HIWIP.



The Koch smoke-tender unit introduced by the Dowson and Mason Gas Plant Co.

Special Tests for Drivers

In order to reduce still further their accident rate, Wall's have introduced their own driving test for all prospective transport drivers.

Approved by the Metropolitan Police School, the test is carried out by instructors of local schools of motoring in towns where the company's transport is based. Tests occupy approximately 1½ hours and a standard form of test report has been issued to all the company's divisional headquarters.

Drivers who fail their test are not engaged. Staff drivers whose accident records are unsatisfactory are also tested.

Food Group Conversazione

The sixth annual conversazione of the Food Group of the Society of Chemical Industry was held jointly with the Agriculture Group on November 12 at the Park Royal Brewery by kind invitation of Arthur Guinness, Son and Co.

The guests were received by Prof. H. D. Kay, C.B.E., D.Sc., F.R.S. (chairman of the Food Group) and Mrs. Kay, and Mr. N. B. Smiley (of the Guinness Board) and Mrs. Smiley.

Parties were conducted over the brewery and were shown how Guinness is made from the raw materials to the finished product. Another item on the programme was the film show of the Food and Agriculture Groups' summer tour in the Netherlands.

During the intervals, guests were able to enjoy the excellent buffet provided by the company.

Automatic Sliding Doors

Doors developed primarily for lift entrances by The Express Lift Co. have been adapted to provide automatic sliding doors suitable for factories and warehouses. Because the doors close automatically they prevent draughts and facilitate the maintenance of a constant temperature within the shop, thus ensuring maximum benefit from the consumption of fuel for space heating.

The doors, which consist of two sliding panels opening from the centre, run on ball bearing rollers on bright steel tracks. They are opened and closed by an electric operator which, to prevent excess torque being transmitted to them, incorporates a clutch.

Fitted to the doors is a sensitive edge that ensures their instant reversal should an obstruction be encountered. An adjustable time delay is embodied in the controller so that the doors are held open for any predetermined period within the limits allowed. The doors are opened by means of press buttons which can be fitted at any convenient point.

Fareham Experimental Slaughterhouse

The new Government experimental slaughterhouse at Fareham is one of two experimental and demonstration slaughtering centres to be operated by the Ministry of Food. It has been planned to serve the needs of a large urban area with a population of over half a million. The other Government experimental slaughterhouse in operation at Guildford, which was opened in March, 1952, was planned to serve a medium sized town and a surrounding rural district with a total population of about 200,000.

The Fareham slaughterhouse as a demonstration centre will be available for inspection by representatives of local authorities and organisations connected with the slaughtering industry throughout the country. Apart from its use as an experimental and demonstration centre, the slaughterhouse will provide some additional slaughtering capacity which is urgently needed to deal with the increased numbers of fatstock that are being produced as a result of the programme of agricultural expansion.

The premises and equipment have been designed to try out what is termed "line dressing" on a scale suitable to conditions in this country. There are facilities for maintaining a high standard of hygiene and for adequate meat inspection, and for the humane treatment of animals, including the segregation of diseased or injured beasts. The best possible working conditions are provided for the operatives and heavy manual labour is avoided as far as possible.

At appropriate points along the dressing lines, certain organs and materials (fat, tripe, gut, hides, etc.) are removed either to chosen rooms or by elevators to the first floor gut and hide room. This room is a departure from standard practice in this country and abroad.

Blood intended for human consumption is caught in containers in the usual way, to await the inspection of the carcass. Blood to be used in the manufacture of feedingstuffs or fertilisers is collected and stored in an underground tank from which it is blown by air pressure to a vehicle outside.

The pre-cooling room is designed to hang half a day's kill so that the surface moisture can evaporate from the carcasses before they are put into the cold rooms. The meat in the cold rooms is held at 38° to 42°F. In addition, there are two small rooms which are to be used for red offal and for research investigations into the holding of meat and offal at low temperatures.

No provision has been made to process by-products. The aim has been to arrange that the by-products will be handled in such a way that they can be sent to processing plants without deterioration in condition. One unique feature is that the stomach contents go direct into a special hopper where drainage takes place; since the contents are sealed off in this hopper they cannot contaminate any material in the premises.

The carcasses pass over the bleeding trough on to the pritch plate.

B.B.I.R.A. Annual General Meeting

Details of the progress made in the Association's research work for the year 1951-52 and the programme for 1952-53 are contained in the report of the British Baking Industries Research Association, presented at the annual meeting.

Most of the work of any new Research Association, during its first years of existence, must be devoted to compiling scientific information of a short-term character; the attraction of new members, and the retention of the original ones, depend considerably on its success in this direction.

The baking industry is probably more prone than many to consider research from the viewpoint of immediate technical assistance rather than from a perception of the value of long-term fundamental work. It has been the aim of the Director, Dr. J. B. M. Coppock, steadily to increase the latter type of research, giving at the same time as much technical assistance as possible to stimulate faith and interest in the Research Association.

The main problem in carrying out such a programme is the maintenance of a reasonable opportunity for the research staff to work on fundamental research without being unduly overburdened with short-term problems and enquiries.

The details of research are given in the report under four main headings. Under "bread," mention is made of 18 special studies, including anti-staling, storage, vitamin analysis, dough testing instruments, studies on yeast relating to its storage, age, and function in breadmaking, and other important items.

Ten different items of research are enumerated under "flour confectionery," among which are studies of emulsions and emulsifying agents, studies in shortening, the quality of egg products and their influence on baking quality, etc.

A number of interesting investigations on biscuit making problems were made, among which was work on the physical measurement of biscuit and wafer flours and its relation to baking practice; this work is being pressed forward rapidly with the new flour testing instruments now available.

General work included the study of tasting techniques, bakery equipment and machinery, raw materials, hygiene in bakeries, food spoilage, analytical problems, and numerous other items.

The principal guest at the luncheon which followed the annual meeting was Major The Rt. Hon. Gwilym Lloyd-George, M.P., Minister of Food. Other speakers were The Rt. Hon. Viscount Alexander of Hillsborough, and Dr. R. T. Colgate, chairman of Council.

Following the luncheon there was an open technical session during which Prof. A. C. Frazer, the Association's medical consultant, gave an address on "Diet and Disease," in the course of which he discussed the carbohydrates, coeliac disease, the lipids, etc., in relation to diet and health.

Prize Malting Barley

Among the barleys recently purchased by Henry Page and Co. was a parcel of "Earl" barley that subsequently gained the Championship Award for the finest sample of barley in all classes entered in the Malting Barley Competition at the Brewers and Allied Traders Exhibition.

The barley which was sold to the company by W. L. Duffield, Saxlingham Thorpe, Norwich, was grown by Mr. R. Youngs, Broad Farm, Salhouse, Norwich.

Plant for the Brewer

Two open-type bottle cooling trays operated by a condensing unit, an icemaker operated by the Presmetic hermetically sealed system, a Force Vec cooler in the cellar section, and a cask cooler were exhibited by Prestcold at the recent Brewers' Exhibition.

■

The application of the Mono pump to duties associated with vacuum liquid filling units was demonstrated at the Exhibition. The inherent characteristics of this pump are ideally applied to this duty and a more simplified and efficient arrangement of equipment can be achieved by its use.

The ability of the pump to alternate between the handling of air and the liquid product, together with its automatic and unfailing self-priming, obviates the necessity of an interceptor receptacle, which is an essential auxiliary with dry vacuum pumps. The advantageous constant level characteristics of the vacuum filling method are retained, the surplus liquid being drawn off from the filled bottle by the pump and returned direct to the supply container. Its use also eliminates the nuisance experienced on occasions when an operator's attention is distracted and a consequential overflow from the interceptor receptacle interferes with the working of a vacuum pump.

■

Exhibits on the APV stand included a 135 barrel stainless steel brewing copper, the first copper in this metal to be manufactured in this country and the second in the world. This exhibit incorporated a number of new design features; of particular interest was a patent sleeve heater, consisting of cones mounted vertically and surmounted by a conical boiling fountain. A very high rate of heat transfer can be obtained with this device using steam pressures as low as 30 p.s.i.

Paraflows formed a prominent section of the company's exhibits, there being displayed the new medium capacity, high pressure all

The 135 barrel stainless steel brewery copper.

stainless model. As it withstands pressures up to 100 lb. per sq. in., this machine is particularly suitable for the bulk pasteurisation of beer. A complete Paraflow wort cooling installation of 85 barrels per hour capacity illustrated the space saving achieved by the use of this type of machine.

The company have recently taken over the sole manufacturing and selling rights of the Bowser filter in this country, an example of which was also shown. It is being manufactured in three sizes.

Punches and Dies

Punches and dies made by Manesty Machines are now being despatched with a protective plastic coating, which can be removed by piercing with a sharp wooden stick, when the coating will peel off in one piece. A knife should not be used or they may be damaged.

The punches and dies are covered by a hot dipping process and a nylon thread is used for this purpose. This thread should be removed when the plastic covering is taken off. Nylon is used as it has no absorbent properties and will not, therefore, track moisture into the covering.

This process leaves a protective coating of oil on the punch or die. If the punches or dies are to be used immediately, this oil should be wiped off.

By piercing the covering around the shank of each punch, the protective covers can be re-used for protecting their delicate tips.

APPOINTMENTS

The Lord President of the Council has appointed Sir Hugh Beaver, M.I.C.E., M.I.Chem.E., managing director of Arthur Guiness, Son and Co., to be a member of the Advisory Council for Scientific and Industrial Research.

Mr. I. A. R. Stedeford, chairman of Tube Investments, has resigned his membership of the Council because of pressure of other duties.

■

Mr. S. A. Lancaster, managing director of Procea Products, has been appointed Chairman of Appeal for 1953 for the Journeymen Bakers' and Confectioners' Pension Society.

This follows his appointment as last year's festival chairman of the London Master Bakers' Benevolent Institution.

■

Col. C. C. L. Tofield, who until recently was general manager of P. B. Cow and Co., has become general commercial manager of Rubber Improvement Ltd.

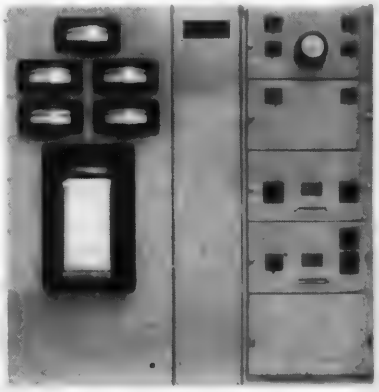
Dr. Hugh B. Fraser, who until recently was general manager of Petrochemicals, and who was previously with the North British Rubber Co., has joined the company as general manager of the Wellingborough factory.

■

Mr. Kenneth W. J. Avery, late assistant to the City of Chester Analyst, has been appointed head chemist to John Burgess and Son.

Automatic Control Gear

Automatic starters for food manufacturing machinery and temperature and humidity control equipment are manufactured by Watford Electric and Manufacturing Co. The latter is mounted in draw out rack type enclosures giving easy access for maintenance and inspection together with a pleasing appearance.



A typical temperature control panel.

BOOKLETS RECEIVED

A review of progress in the printing trade is made in the anniversary number of *Inklings*, published by Coates Bros.

*

Articles on hydrogen ions, plating thickness determination, "Q" factor measurement, and the design of microwave noise generators are included in the current issue of *Marconi Instrumentation*.

*

In order to assist the potential user of radioactive isotopes in selecting electronic equipment to suit his special needs, a booklet has been published by the Scientific Instrument Manufacturers' Association, in collaboration with the Atomic Energy Research Establishment, which gives details of the instruments and accessories for radio-isotope applications.

*

The application of the plastic theory to the design of mild steel beams and rigid frames is the subject of a recent technical brochure prepared by a committee of the British Constructional Steelwork Association, in collaboration with the British Welding Research Association.

Erections and Extensions

A new bakery is to be constructed at Lowestoft by Waveney Co-operative Federal Bakeries.

*

Plans have been prepared by Coastal Canneries to build a factory at Hamilton Road, Lowestoft.

*

Plans have been approved for Wall's to carry out extensions to their factory at Mottram Road, Hyde.

*

A new bottling factory is being constructed on a site at Stranton, West Hartlepool, by J. W. Cameron and Co.

*

Building work has now begun on a site adjoining the Birlec main offices and works at Tyburn Road, Erdington, Birmingham. These extensions will provide additional drawing office capacity and other facilities, while similar work at the other end of the factory will lengthen the existing works bays.

*

A large modern factory at the former Caird Shipyard site in Greenock is shortly to be taken over by John Drummond and Sons, box makers. This is one of two new factories erected on this site after long negotiations for the return of the area from Admiralty control. The factories now being completed are direct flow large floor units of some 450 ft. by 150 ft. with natural light, excellent amenities for employees, and all the advantages of modern approach and modern facilities.

*

The proposed application for modernisation of their Greenock refinery by John Walker and Co. (Sugar Refiners) will cost some £190,500. The cost of the whole scheme, of which this is part, will be about £300,000.

The intention is to modernise the buildings and plant at present used for raw sugar storage and affination. The proposals were first opposed by the Minister of Food but a revision has been secured following strong representations by local interests that the Greenock sugar industry must be allowed to keep pace with progressive refinery plants in the south.

*

Larger premises at 3, Highfield Road, Edgbaston, Birmingham, 15, have been taken over for the Midlands Office of the Paterson Hughes Engineering Co. This has been necessary because of the considerable expansion of business in the area covered by this office, comprising Staffordshire, Warwickshire, Leicestershire, Nottinghamshire, Worcestershire, and Derbyshire.

As at the Glasgow and London Offices, a complete advisory service is available to industry on all aspects of mechanical handling, and a design staff fully trained to carry out all types of mechanised projects is maintained.

OBITER DICTA

● All our flowers contain chlorophyll.—*Notice in a New York florist's window.*

● Any food which has to be disguised cannot be good food.—*Member of a Women's Institute.*

● I speak French better when my mouth is full of spaghetti. *Italian film star, Sylvana Pampanini.*

● Is the Minister of Food aware that 1s. 8d. worth of butcher's meat would hardly cover a saucer?—*Mrs. Jean Mann, M.P.*

● Cookies like Mother makes—ten cents; cookies like Mother thinks she makes—twenty cents.—*Advertising sign in an American café.*

● Item on a Pullman menu: cold collation and combination salad. Asked what it meant, the waiter said: "Nothing; it's only on in summer."—"*Daily Telegraph.*"

● The hand that stirs the porridge rules the world; but for goodness sake let it be good porridge.—*Dr. F. Marian McNeill.*

● I've tried imported mutton myself. We didn't roast it, we braised it, and when it was cooked you could hardly get your fork in the gravy.—*Bradford butcher.*

● The justification for colouring a cake or kipper artificially is perhaps to be deplored in the same way as the colouring of a woman's face.—*Dr. Magnus Pyke.*

● How tantalising to hear Mrs. Archer of the B.B.C. offering Philip plates of eggs and bacon when the only eggs seen for weeks are the Danish grade C variety, one per book per week.—"*Middlesex Advertiser.*"

● A Frenchman laughed at me the other day and said we are the only nation in the world to spread margarine on its bread—and the only country to put artificial cream in its cakes.—*Letter to the "Daily Express."*

● Town dwellers no longer earn their daily bread by muscular toil. But they still have old-fashioned appetites. So they over-eat and fail to balance output of energy and intake of energy through food—lack of balance between imports and exports.—*Prof. R. C. Garry.*

COMPANY NEWS

The difficulties facing biscuit manufacturers were outlined by Mr. William P. Webster, chairman and managing director of Wright's Biscuits, at the sixteenth annual general meeting of the company. During the course of his review, Mr. Webster made a plea for the derationing of sugar on the grounds that in recent months the world price of sugar had fallen, thus considerably reducing the cost of derationing.

*

At the 49th annual general meeting of Thos. W. Ward Ltd., it was recommended that there should be a payment of a final dividend on the Ordinary shares of 10 per cent. less tax, together with a bonus of 5 per cent. less tax (making a total of 20 per cent. less tax for the year to June 30, 1952). It was also recommended that there should be a payment of a final dividend of £5 10s. per cent. on employees' shares, making £10 10s. per cent. for the year to June 30, 1952, tax free.

World Food News

Bulk Oil Deliveries

Until now, the fish processing factories at Walvis Bay have had to run fish body oil into drums before sending it to the Marine Oil Refiners of Africa, Ltd., at Simonstown. Under a new arrangement, this oil is being sent to the refinery in bulk, by means of a pipeline connecting the four Walvis Bay factories to three storage tanks in the harbour area. These tanks, with a total capacity of 1,290 tons, feed the oil to coasters and other vessels equipped with bulk oil tanks. At Table Bay, the body oil is run into two tanks, each with a capacity of 1,100 tons, and thence it is transported in bulk rail carriers to the refinery and other consumers.

Separation of Pod Fragments

In an American plant packaging frozen vegetables, the loose skins, splits, leaves, stems, and pod fragments are separated from washed lima beans and peas by a stream of air. The air flotation unit that effects this separation is claimed to operate at a rate of 3,000 lb. per hour.

The unit is cutting processing costs, eliminates undesirable vegetable parts efficiently, reduces the time needed for inspection, and is conserving space while releasing inspectors to perform other duties. Constructed entirely of stainless steel, the separator unit is designed with a variable feed device that permits control of the flow of the product at the volume desired for the production line.

Fish Meal and Fish Oil

In a statement by the Department of Commerce and Industries it is said that the further expansion of fish canning in South Africa will not be at the expense of South Africa's needs of fish meal and fish body oil. Already the annual output of fish meal is between two and three times the volume of the local demand, and with constantly expanding production, fish meal exports, which are of substantial foreign exchange value, are going up all the time.

The quantity of fish oil produced is at present fairly stable at around 16,000 tons per annum, all of which, by virtue of arrangements between the industry and the Controller of Soaps and Oils, is marketed within South Africa. In the very near future, however, it is expected that a rising output of fish body oil will enable the industry to turn its attention to export markets. Efficient plant for this purpose is installed in many factories.

Surface-active Agents

The large number of non-ionic surface-active agents made possible by varying the polyhydric alcohols and fatty acids is described in a leaflet "Surface-active Agents Find Widening Uses," issued by Glyco Products.

Canned Oysters

An active oyster canning industry may be established profitably in Australia as the result of efforts by the Fisheries Division of the Commonwealth Scientific and Industrial Research Organisation.

On discovering that the Tasmanian mud oyster was dying out, its officers decided to try to replace it with Pacific oysters from Japan. These were transplanted in Tasmanian waters and have continued to thrive. They grow much faster and to a much greater size than the native oyster and the C.S.I.R.O. says they will be ideal for canning.

Oyster canning in Australia so far has been on a small scale because of the high cost and small supply of native oysters, but a full-scale industry may now be possible with the cultivation of the Pacific oyster.

German Confectionery Packs

German bakers and patissiers are seeking to increase their sales by packing cakes, pastries, and sweets in attractive Cellophane bags and boxes.

Apart from general purpose packs, two special lines have gained particular favour: the picnic or travel box, and the gift package. The latter is of tasteful design and decoration, while the travel pack frequently incorporates a rather stronger box topped by a transparent lid.

Trade advisers have suggested the use of stick-on labels and colourful cord to give the package a "personal" air without having to go to the expense of using specially printed packs.

Gift packages are being developed by German confectioners to increase sales.

OVERSEAS ENQUIRIES

Foodstuffs for Angola

Antonio Paula de Carvalho and Cia., Lda., Caixa Postal, 489, Luanda, Portuguese West Africa, desire to obtain an agency for tinned foodstuffs, condiments, jellies, jams, and other groceries.

Firms interested in this enquiry are asked to communicate direct with the company, sending full details, preferably in the Portuguese language.

*

Biscuit Distribution

The General Tobacco and Grocers Co., Inc., of 12330, Hamilton Highland Park, Detroit, 8, Michigan, wish to secure wholesale distribution rights in and for the State of Michigan for biscuits. The firm wish to purchase and stock on their own account and to create their own price structure based on landed costs.

The General Tobacco and Grocers Co., Inc., specialise in the wholesale distribution of food products and it is reported that the firm is capable of providing sound and aggressive representation to any British food manufacturer seeking entry into this market. They might also be interested in offers for other foodstuffs, such as jams, relishes, condiments, candies, chocolates, and toffees. The firm are already handling a number of United Kingdom products.

The products mentioned are subject to the United States Food and Drugs Administration Regulations, details of which are available from the Commercial Relations and Exports Department of the Board of Trade.

Any firms interested in this enquiry should communicate direct, by air mail, with Mr. Max Kirtz, President of the Detroit firm, giving:

(*a*) Freely offered wholesale prices in the United Kingdom *ex* works.

(*b*) Costs of packaging (U.S. duty is assessed on the total of (*a*) and (*b*)).

(*c*) Insurance and freight per through bill of lading direct to Detroit and should also send literature and samples of the goods they are offering.

*

Food Preparations

C. A. Phillips, Ltd., P.O. Box 209, Georgetown, British Guiana, wish to contact United Kingdom firms requiring agency representation in British Guiana for chicken noodle soup preparations in air-tight packages, insulated electric wire and cable, and vacuum flasks.

Any firm interested in this enquiry should communicate with the enquirers direct.

Fish and Potatoes

A new company, Grell and Co. (Jamaica) Ltd., of 24, West Parade, Kingston, British West Indies, have asked to be put in touch with United Kingdom suppliers of, *inter alia*, dry salted fish, smoked herrings, pickled mackerel and herrings, canned fish, and potatoes.

Any firm interested in this enquiry should communicate with the enquirers direct at the address given above.

•

Processing Machinery

Fabrica de Aceites de Maracay, Maracay, Estada Aragua, Venezuela, are interested in equipment for the manufacture of vegetable lard; tin making machinery; and vegetable oil plant for dealing with copra, cottonseed, and sesame.

Full details, with prices and delivery dates, should be sent direct to Fabrica de Aceites de Maracay.

•

Heather Honey

Mr. Ormond R. Bailey, one of the partners in George Rogers and Co., 3277, Bloor St. W., Toronto, is interested in obtaining heather honey from the United Kingdom.

The honey is required in one pound gift containers for sale to fancy food trade outlets; suggestions for packaging include such articles as decorative mugs, jugs, and tankards.

Although the Toronto firm normally operate on a commission basis, they are prepared, in certain circumstances, to buy outright for distribution. Most of their activities are concentrated in Ontario, but they also represent a number of United Kingdom manufacturers of foodstuffs for the whole of Eastern Canada.

Honey is subject to the Canadian Food and Drugs Act and Regulations and to regulations under the Fruit, Vegetables, and Honey Act, details of which are available from the Commercial Relations and Exports Department of the Board of Trade.

Russia's New Beet Harvester

A new Soviet beet harvesting machine, a number of which have been sold to Czechoslovakia, pulls the beet, cuts off the leaves and cleans the root, and piles the leaves and roots separately. It harvests three rows at a time, and, although eight to 10 men must follow the machine to deal with the roots that are not properly separated (about 10 to 15 per cent.), it is claimed that the harvest can be completed much more quickly and with only one-quarter of the manpower needed for manual harvesting.

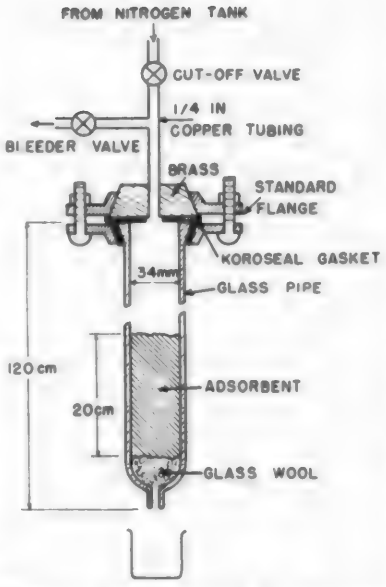


Diagram of apparatus used for corn syrup analysis by selective adsorption.

Corn Syrup Analysis

A procedure for the analysis of corn syrup, recently developed by Emma J. McDonald and Roger E. Perry, Jr., of the U.S. National Bureau of Standards organic chemistry laboratory, makes possible the quicker and more accurate determinations of dextrose, maltose, and dextrin fractions, by the use of the selective properties of certain carbon adsorbents. After the mixed syrup has been adsorbed on a suitable carbon column, the several sugars can be removed selectively by three successive washings under pressure with water, 5 per cent. ethyl alcohol, and 15 per cent. ethyl alcohol. After the individual sugars are thus rapidly separated, each may be determined quantitatively by well-known methods.

The apparatus required for the new separation method consists of a glass column, filled with equal weights of the carbon adsorbent (Darco 60, analytical grade) and a diatomaceous earth filler (Celite). The top of the tube is coupled to a nitrogen tank, so that 30 to 50 lb. pressure can be applied to increase the rate of flow of liquid through the adsorbent.

The sample to be analysed is added and allowed to penetrate the column. A one litre portion of water is then passed through under pressure. The water removes the dextrose, but none of the maltose or dextrins. The washing is repeated, using this time a litre of 5 per cent. ethyl alcohol; this removes the maltose, leaving the dextrins. The dextrins are then removed with a litre of 15 per cent. ethyl alcohol. Finally, on completion of the run, the column is cleaned with 95 per cent. alcohol and then washed with water; this removes all traces of carbohydrates and leaves the apparatus ready for the next run. The whole separation can be accomplished in about 1½ hours.

Each of the three washings is evaporated under diminished pressure to a volume that can be made up to 100 ml. The dextrose and maltose fractions are analysed quantitatively either by polarisation or by one of the accepted chemical procedures, such as Munson and Walker's reducing sugar method. The dextrin fraction, consisting of a mixture of polydextrose molecules, is given in terms of its dextrose equivalent.

Reproducibility of the order of one per cent. in dextrose and maltose determinations is attainable with the new method. Most of the small uncertainty is the result of incomplete and slightly inconstant recovery from the carbon column. Recovery averages about 97 per cent., and varies with the particular column used. However, the incomplete recovery can be largely compensated for by experimentally establishing a correction factor for the particular installation. Once the sugars have been separated, accuracy of the order of 0·3 per cent. is attainable by chemical methods. Polarimetry tends to give somewhat less accurate results.

If the alcohol concentration of the washing solution is increased in several steps between 5 and 30 per cent., the dextrins can be divided into triose, tetrose, and higher polysaccharides. For most analytical purposes where time is important, however, it seems quite adequate to use the three-solution procedure and leave all the dextrins grouped together. Studies are continuing to extend the new method to include sucrose and invert sugar in syrups.

Appointment

Mr. Prafull H. Bhatt, author of "Guavas in Syrup" (FOOD MANUFACTURE, 27, 5, 173), has been appointed Development Officer, Fruit Products, Central Government of India.

Pakistan's New Starch Factory

Work has begun at Peshawar on the construction of a new starch factory for the Zeb Corn Products Company. The plant, which will have an output of about 10 tons of starch per day, will cost one million rupees. In addition, dextrins, glucose, oilcake, and gums are to be manufactured.

Production is expected to be sufficient to cover the country's needs and to allow a margin for export—probably to the Middle East, Singapore, and Burma. Machinery for the new plant has already been imported from Germany.

News from the Ministries

Appointment

The Minister of Agriculture and Fisheries, Sir Thomas Dugdale, Bt., M.P., has appointed Mr. G. L. Wilde to be his Principal Private Secretary and Mr. M. M. A. Gray to be his Assistant Private Secretary.

Commonwealth Sugar Agreement

As a result of discussions between the Ministry of Food and the representative of the sugar exporting territories of the Commonwealth, it has been agreed that the price for "negotiated price sugar" in 1953 shall be £42 6s. 8d. per ton.

At the request of Commonwealth representatives, the United Kingdom Government has also agreed to the extension of the Commonwealth Sugar Agreement for one further year, that is, up to the end of 1960.

The Flour Order, 1952

The Flour Order, 1952, has been further amended so as to make the following changes:

1. The prices prescribed for imported flour sold for export are reduced by 3s. per 280 lb. with effect from November 30, 1952.
2. The deposit charges on returnable bags and sacks are reduced as shown below, with effect from December 14, 1952.

	s.	d.
224 or 280 lb. sack	6	6
140 lb. flour bag customarily used as such before September 3, 1939 ...	5	0
Any other returnable bag	2	6

Sulphur Dioxide in Vegetables

Authorisation has been given to import into the United Kingdom and sell the dehydrated vegetables set out in the table below so that each variety of dehydrated vegetable may contain a quantity of sulphur dioxide not exceeding the quantity shown in relation to it in the table:

	Parts per million by weight.
Dehydrated cabbage ...	3,000
,, potatoes (including mashed potato powder) ...	550
,, runner beans	2,000
,, turnips ...	2,000
,, spinach ...	2,000
,, swedes ...	2,000
,, peas	2,000
,, mixed vegetables ...	2,000
,, parsnips ...	2,000
,, carrots ...	2,000

Services to Exporters

A summary of the services which the Board of Trade can make available to manufacturers and merchants engaging in export trade is contained in a recently published booklet.

Dutch Bacon Agreement

A new contract for Dutch bacon, to follow on the four-year contract which expired on December 31, 1952, is to be made between the Ministry of Food and the Dutch Government.

Under the new contract, the United Kingdom will take up to 35,000 tons of bacon between now and January 2, 1954, at the price of 252s. 6d. per cwt. f.o.b.

Agricultural Education

After consultation with the Minister of Education, the Minister of Agriculture and Fisheries has set up a Working Party with the following terms of reference: "To review the relations between the agricultural education service of Local Authorities and the National Agricultural Advisory Service, and to make proposals for their more effective co-operation; to examine the need for an inspectorate of agricultural education; and to consider the future of the Joint Advisory Committee on Agricultural Education."

The membership of the Working Party is as follows:

Lord Carrington, M.C., Joint Parliamentary Secretary to the Ministry of Agriculture and Fisheries (chairman).

F. Bray, C.B., Under-Secretary in the Ministry of Education.

E. Shaw Browne, J.P., chairman of the Notts. Agricultural Executive Committee.

W. S. Gibson, Provincial Director, National Agricultural Advisory Service.

Dr. T. Loveday, chairman of the Joint Advisory Committee on Agricultural Education.

J. H. Parker Oxspring, M.B.E., Director of Education, Staffordshire.

Prof. R. Alun Roberts, University College of North Wales, Bangor.

F. Rollinson, M.B.E., officer of the National Union of Agricultural Workers, recently retired.

Sir James Scott-Watson, C.B.E., M.C., Chief Scientific Adviser to the Ministry of Agriculture and Fisheries.

W. J. Simmons, J.P., farmer.

Sir Offley Wakeman, Bt., D.L., J.P., chairman of the Shropshire Education Committee.

C. H. M. Wilcox, Under-Secretary in the Ministry of Agriculture and Fisheries.

Any organisation or individual interested in questions within the Working Party's terms of reference is invited to submit written evidence. Requests to give oral evidence will be considered.

All communications of this nature should be sent to the Secretary to the Working Party, at the Ministry of Agriculture and Fisheries, 1-4, Cambridge Terrace, Regent's Park, London, N.W.1.

Semi-medicated Sweets

The Chocolate, Sugar Confectionery, and Cocoa Products Order, 1951, has been further amended (S.I. 1952, No. 1961) so as to free from price control the semi-medicated sweets listed in the Order. The amending Order came into force on November 16, 1952.

De-control of Bananas

In view of the improvement in the banana supply position, price and distribution control ceased at the end of 1952.

It was also agreed upon, after consultation with the producers in the British Cameroons, that the importation and marketing of West African bananas should be returned to private account as from the same date.

Plant Breeding at Cambridge

The Plant Breeding Institute at Cambridge, formerly part of the School of Agriculture, Cambridge University, has now been constituted as an independent Research Institute. It will continue to be financed by grant-aid from the Ministry of Agriculture and Fisheries and to come under the scientific oversight of the Agricultural Research Council.

A governing body has been appointed by the Minister of Agriculture and Fisheries, in agreement with the Agricultural Research Council, and the Institute now takes the form of a company limited by guarantee, and without share capital. The membership of the governing body includes representatives of the farming industry and also of scientific interests in plant breeding and allied scientific subjects. Its membership is as follows:

Prof. Sir Frank Engledow, C.M.G., M.A., B.Sc., F.R.S. (chairman).

Prof. G. E. Briggs, M.A., F.R.S.

Prof. W. Brown, M.A., D.Sc., F.R.S.

Mr. E. Cave.

Prof. S. C. Harland, D.Sc., F.R.S., F.R.S.E.

Prof. H. Ian Moore, M.Sc., Ph.D., N.D.A., Dip. Agric. (Cantab.).

Prof. J. W. Munro, C.B.E., M.A., D.Sc.

Prof. T. G. B. Osborn, M.A., D.Sc.

Mr. R. W. Ward.

Information and Advice

This Service is available for subscribers to FOOD MANUFACTURE. Postal replies will be sent if a stamped, addressed envelope is enclosed with enquiries.

Thick Sauce

B.6055. *Could you please let us have a formula for a thick sauce.* (Essex.)

The following formula is given as a basis for trial:

Malt vinegar (5½ per cent.) ...	30 gal.
Ginger syrup	20 ,,
Raw onion chopped	50 lb.
Tomato purée (triple conc.) ...	10 gal.
Apple pulp	50 lb.
Dates	100 ,,
Foots sugar	60 ,,
Lime juice	1 gal.
Shallots	10 lb.
Chopped garlic	10 ,,
Anchovies *ex* brine	10 ,,
Orange marmalade	50 ,,
Salt	5 ,,
Cayenne	4 oz.
Cloves	4 ,,
Mace	4 ,,
Coriander	4 ,,
Cardamon	2 ,,

The ingredients are simmered for two hours. Then 6 lb. of gum tragacanth in 10 gal. of vinegar and 15 lb. of wheat flour in 5 gal. of vinegar are added. The whole is heated again until the starch has thickened. Finally, 1 oz. of oil of thyme, ½ oz. of oil of marjoram, and ½ oz. of oil of bay are added and sieved.

Potted Meat

B.6063. *We should be glad if you could furnish us with a formula for potted meat.* (Yorks.)

The following formula is a typical example, which can be modified to suit specific requirements:

		Stock seasoning	
Beef, shin, etc. ..	6 lb.	Salt	1 lb.
Pork-head meat ..	2 lb.	Ground white pepper	4 oz.
Cooked rinds	2 lb.	Ground mace ..	1 oz.
Stock (approx.) ..	4 lb.	Ground ginger ..	1 oz.
Seasoning (approx., to taste)	5 oz.	Ground pimento ..	½ oz.

The meat and rinds should be allowed to simmer steadily for about five hours, in just sufficient water to cover. They are then removed from the copper and passed twice through the fine plate of a mincer. After being replaced in the copper with the required quantity of stock and the seasoning, and stirred thoroughly, the mixture should be allowed to simmer for a few minutes before being poured into cartons and covered with melted margarine when cold. As an alternative, it can be poured hot into 1 lb. jars and covered with clarified mutton fat, with a Cellophane seal on top of the jar.

Almond Blanching

B.6161. *Could you please let us have some information on the blanching of almonds prior to their manufacture into marzipan?* (Ireland.)

Almonds are best blanched in a machine which consists of a series of rubber rollers which rub the skins from the almonds, the skins being drawn into a receiver, and the blanched nuts passing into another receiver, which is transferred to a drying room at 100°F. The dried nuts are passed through a mincing machine, thence through a refiner. The final sugar-almond paste is cooked in a marzipan cooker, which consists of a rotating, cylindrical pan inside a steam-heated jacket. The stirring gear is stationary, and attached scrapers prevent the mass adhering to the walls and base of the pan.

For large scale operation, an automatic unit has been designed for almond grading, scalding, draining, and blanching.

Information Supplied

The Enquiry Service has dealt with requests for the names of manufacturers and suppliers of plant, machinery, and materials, and also general information as follows:

B.6060. *Aluminium containers.* (Lancs.)
B.6061. *Cake making equipment.* (France.)
B.6064. *Starch sugar.* (London.)
B.6065. *Biscuits.* (Malaya.)
B.6066. *Roasted and salted nuts.* (Norfolk.)
B.6067. *Jam fillers, lemon curd, and mincemeat.* (N. Zealand.)
B.6068. *Potted meat standards.* (Yorks.)
B.6071. *Liquid cheese flavour.* (Notts.)
B.6073. *Horseradish cream.* (London.)
B.6076. *Can rejecting equipment.* (France.)
B.6078. *Orange slicer.* (Yorks.)
B.6079. *Baking ovens.* (Malaya.)
B.6080. *Icing sugar.* (India.)
B.6081. *Plywood drums.* (Ireland.)
B.6082. *Emulsifiers.* (U.S.A.)
B.6085. *Oils and fats.* (Australia.)
B.6086. *Silver coated dragées.* (London.)
B.6087. *Potato straws.* (Lancs.)
B.6088. *Carrot juice.* (Ireland.)
B.6089. *Electric branding irons.* (Ireland.)
B.6090. *Hydrogenisation of fat.* (Yorks.)
B.6092. *Mallow depositing equipment.* (Lancs.)
B.6093. *Milk powder substitute.* (London.)
B.6094. *Syrup plant.* (British West Indies.)
B.6095. *Bottle closures.* (S. Africa.)
B.6096. *Incorporation of colour and flavour.* (Australia.)
B.6100. *Edible paraffin wax.* (Devon.)
B.6102. *Strained baby foods.* (Wilts.)
B.6104. *Fruit cakes for export.* (Ireland.)
B.6105. *Potato crisps.* (Scotland.)
B.6108. *Galvanised hooks and rails.* (Yorks.)
B.6111. *Prepared mustard.* (N. Ireland.)
B.6116. *Almond drying.* (Lancs.)
B.6117. *Powdered pectin.* (Salop.)
B.6125. *Mixing equipment.* (New Zealand.)
B.6127. *Vacuum packs for food.* (London.)
B.6129. *Steam pans.* (Cyprus.)
B.6131. *Ice flake machine.* (Holland.)
B.6136. *Lecithin.* (Oxon.)
B.6138. *Quick freezing of foods.* (Scotland.)
B.6139. *Thickeners for canned soup.* (Ireland.)
B.6141. *Kippered herrings.* (Australia.)
B.6143. *Industrial chairs.* (Norfolk.)
B.6146. *Crude black molasses.* (U.S.A.)

Recent Patents

682,746. SPECIALITIES DEVELOPMENT CORPORATION: Discharge device for fluids.
682,779. JENKINS AND CO., LTD., R., and OLDFIELD, G. H.: Closure means for pressure or vacuum vessels.
682,814. WILSON, E. G.: Trays for the drying of gelatine and the like.
682,829. DEUTSCHE GELATINE-FABRIKEN: Process for conditioning collagen-containing raw materials used for the production of gelatine or glue.
682,896. KELLIE AND SON, LTD., R.: Filling machine.
682,898. HOOPER, E., and LAMB, H. T.: Dough mixing machines.
682,928. FRENCH, A. A., and MCGREGOR, A. N.: Manufacture of ice lollipops.
683,035. GRAHAM-ENOCK MANUFACTURING CO., LTD., and ENOCK, A. G.: Bottle filling and capping machines.
683,041. HOOPER, E., and LAMB, H. T.: Rotary mixing machines and the like.
683,046. EKELUND, S. F. A.: Laboratory drying ovens.
683,052. LANDERS, FRARY, AND CLARK: Food chopper.
683,093. FISHER, J. H., and MARSHALL, H. B.: Method of producing vanillin, acetovanillone, and other oxidation products.
683,562. FORGROVE MACHINERY CO., LTD.: Packages.
683,617. FLETCHER, S. B.: Fruit-grading machine.
683,664. PEERLESS AND ERICSSON, LTD.: Pie moulding or like machines.
683,693. POWER AND SONS (BOX STRAPPING), LTD., F. A., and PADMORE, J. N.: Tying machines for packages and the like.
683,699. NEW CONVEYOR CO., LTD.: Endless conveyors.
683,724. SIMON (HOLDINGS), LTD., S., LOCKWOOD, J. F., BALL, J. S., and WATTS, G.: Cleaning of grain.
683,769. GERRARD INDUSTRIES, LTD.: Automatic wire tying machines.
683,815. WEBSTER AND CO., LTD., R. W.: Conveyor means, more especially for washing and sterilising machines and the like.
683,850. ROSE BROS. (GAINSBOROUGH), LTD.: Slicing mechanisms.

Abstract of a Recent Specification

Stabilised Starch Derivatives

This invention relates to a method for treating starch, the prime object of which is to produce a starch product of improved stability; that is, one whose aqueous dispersions will maintain a relatively constant viscosity and clarity for appreciable periods of time, as compared to the rapid thickening of gelling and loss of clarity of the corresponding untreated starches under similar conditions.

It has been discovered that the starch derivatives formed by the treatment of starch with the inner esters of beta-hydroxy aliphatic acids (also known as beta-lactones) are characterised by remarkably improved stability.

The term "starch" includes any of the natural starches such as are found, for example, in corn, potato, tapioca, sago, waxey maize, rice, wheat, or sweet potato; also included in this term are the various modifications and conversion products of starch ordinarily referred to in the trade as thin-boiling or fluidity starches, dextrines, and British gums, as well as the other starch derivatives such as starch esters and ethers. The only requirement is that there be present hydroxyl groups to react with the beta-hydroxyl aliphatic acid.

The tendency of aqueous starch dispersions to thicken or gell and become cloudy upon ageing, has been a real disadvantage in many commercial operations. Corn starch, for example, when cooked in approximately 10 to 15 parts of water, quickly changes, upon cooling, from a clear fluid to an opaque, solid gel. Root starches, such as tapioca, while not gelling under the same circumstances to the extent that corn starch does, nevertheless frequently exhibit an objectionable thickening and pasting upon ageing, this tendency being particularly marked in the case of the converted root starches such as British gums, white dextrines, and the like.

Remarkably improved properties of stability are imparted to starch and starch derivatives by permitting them to react with the inner esters of beta-hydroxy aliphatic acids, such as beta-propio-lactone, beta-butyro-lactone, beta-isobutyro-lactone, beta-valero-lactone, and beta - isovalero - lactone. Such treated starch and starch derivatives form aqueous dispersions of substantially the same viscosity as dispersions similarly prepared from the corresponding untreated starch or derivatives. The dispersions of the products treated by this process retain their original viscosity and clarity for far greater periods of time than do similar dispersions of the corresponding untreated starch. Such dispersions of the treated starch need contain no extraneous stabilising chemicals. The treated starch is not perceptibly weaker in adhesive power than the corresponding untreated starch.

675,793. *National Starch Products, Inc.*

Trade Marks

BENGER.—695,878. Jellies (for food), junket, junket powders, malted milk beverages, preparations made principally of milk for use in the manufacture of ice cream, rennet, rennet essence, and vegetable extracts (for food). **Benger's, Limited,** Harvest House, Ipswich, Suffolk, and Homes Chapel, Cheshire; Manufacturers.

LONE TREE.—701,949. Canned fruit juices. **Gibson and Company, Limited** (a Company incorporated under the laws of Kenya Colony), Mincing Lane, Nairobi, Kenya Colony, East Africa; Manufacturers and Merchants.

OAK CROWN.—703,218. Canned meats and cheese. **Schalburg and Company, Limited,** Bank Chambers, London Bridge, London, S.E.1; Provision Importers and Merchants.

CANASTA.—703,426. Meat, fish, poultry and game (other than live fish, live poultry, and live game); meat extracts; cooked, canned, or bottled vegetables and fruits; jellies (for food), jams, dairy products (for food), edible oils, edible fats, and pickles. **Hugh Sparks,** 136, Upper Thames Street, London, E.C.4; Merchant.

SYLVANIA.—706,905. Canned and preserved fruits and candied peel. **Caribbee Products, Limited** (a Company incorporated under the laws of Dominica, British West Indies), Goodwill Estate, Roseau, Dominica, British West Indies; Manufacturers.

Recent patents and trade marks have been selected from the "Official Journal of Patents" and the "Official Trade Marks Journal" and are published by permission of the Controller of H.M.S.O.

New Companies

Promeat, Limited. (510879.) 32, Bishopsgate, London, E.C.2. To carry on business of foodstuff and beverage processors, manufacturers, etc. Nom. cap.: £5,000 in 1s. shares. Dirs.: to be appointed by subs. Subs.: S. Elstone, 149, Stapleton Hall Road, London, N.4 (clerk), and J. M. C. Davidson, 22, Aberdeen Gardens, Leigh-on-Sea (cashier).

H. C. Stammers and Company, Limited. (511498.) To take over the business of flour millers and corn merchants carried on as "H. C. Stammers and Company" at The New Flour Mills, Dereham, Norfolk. Nom. cap.: £24,000 in £1 shares. Permt. dirs.: P. J. Sayer, The Rough Hoe, Dereham, Norfolk; R. P. Sayer, Church Farm House, Sparham, nr. Norwich.

Lawtrex Machinery, Limited. (511505.) 8, Princes Square, Harrogate. To carry on business of manufacturers and exporters of and dealers in mill, factory, and workshop plant and machinery, etc. Nom. cap.: £2,000 in £1 shares. Dirs.: W. M. Andrews, 59, Kingswood Road, W. Bridgford, Notts; A. Bousfield, Fairview, Markham Avenue, Rawdon, Leeds; H. J. Rorke, and W. S. Lawson.

Marquis Food Products, Limited. (511699.) 11, Burley Lodge Place, Leeds, 6. To carry on business of manufacturers of and dealers in potato crisps, etc. Nom. cap.: £100 in £1 shares. Permt. dir.: V. Riley, 75, Alma Road, Leeds, 6.

E. P. Rundle, Limited. (511811.) Commerce House, 6/8, Blagrave Street, Reading. To carry on business of, manufacturers of, and dealers in paper and film bags and wrappers, etc. Nom. cap.: £5,000 in £1 shares. Dirs.: E. P. Rundle, 19, Russell Court, Woburn Place, London, W.C.1; W. E. Ratnett, 19, Clivedon Road, Tilehurst, Reading; W. H. V. Witcher, 19, Monks Way, Reading.

Gaylord House, Limited. (511812.) 2/6, Rennie Street, Salford, 5. To carry on business of exporters and importers, purveyors and manufacturers of foods of all kinds for canning and for glass and bottle containers, etc. Nom. cap.: £10,000 in £1 shares. Dirs.: M. L. Unger and B. M. Unger, 4, Selworthy Road, Birkdale, Southport; P. C. Unger, 134A, Roe Lane, Southport.

Sunda, Limited. (511905.) To carry on business of manufacturers, canners, packers, and vendors of and dealers in foodstuffs and prepared, preserved, patent, malted, cooked, and concentrated foods, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: C. E. Gamberg and E. Urich, addresses not stated. Subs.: J. W. Sharman, 50, The Main Way, Chorley Wood (chtd. secy.); W. S. Wenman, 68, Radcliffe Road, Harrow Weald (clk.).

E. Martin and Son, Limited. (511921.) 20, Willow Street, Accrington. To carry on business of bakers, manufacturing confectioners, etc. Nom. cap.: £2,000 in £1 shares. Dirs.: E. Martin and Annie Martin, 6, Hornby Street, Oswaldtwistle.

A. W. Bayley and Company, Limited. (512009.) 14, Southall Court, Southall, Middlesex. To carry on business of exporters, importers, and manufacturers of and dealers in confectionery, etc. Nom. cap.: £500 in £1 shares. Dirs.: A. W. Bayley and Alice L. Bayley, 14, Southall Court, Southall, Middlesex; W. T. Humm, 14, Wilton Road, Hounslow.

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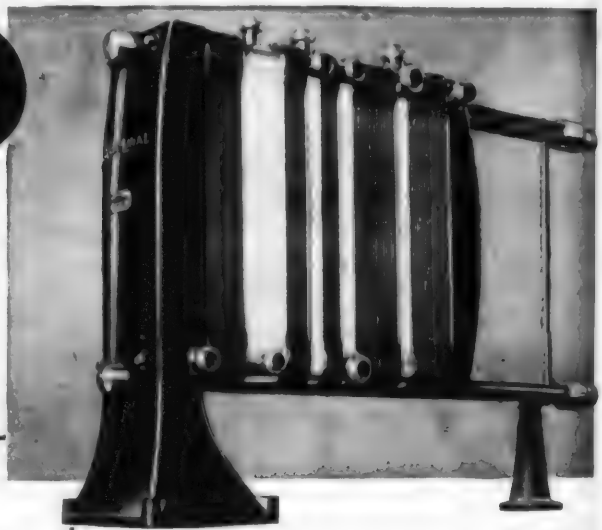

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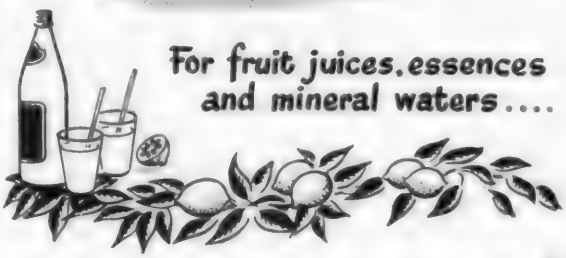

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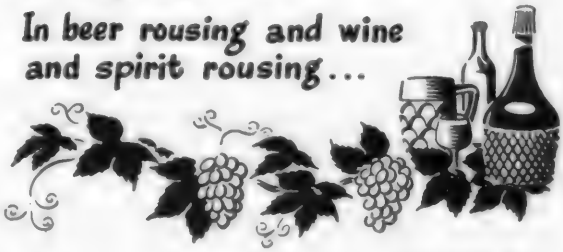

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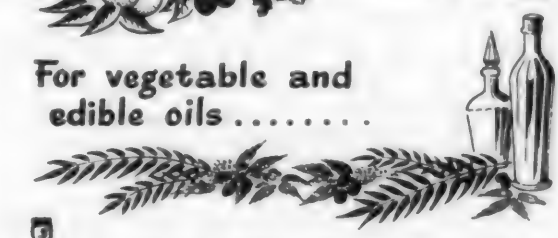

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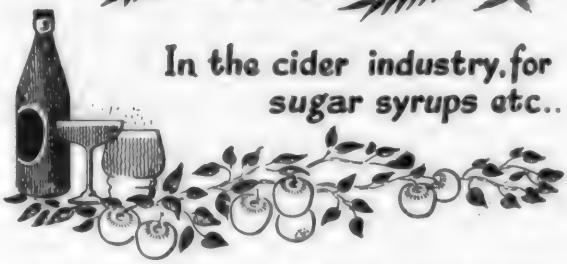

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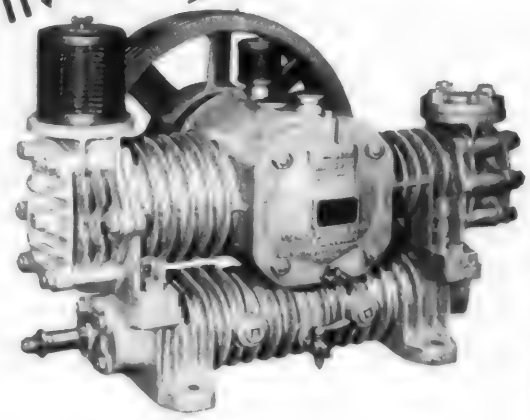

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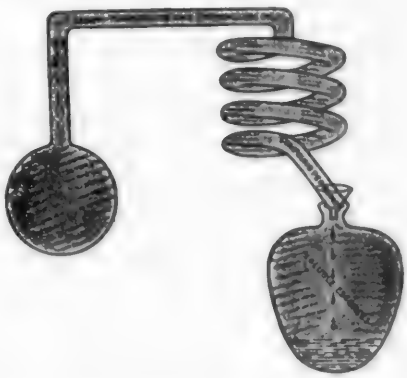

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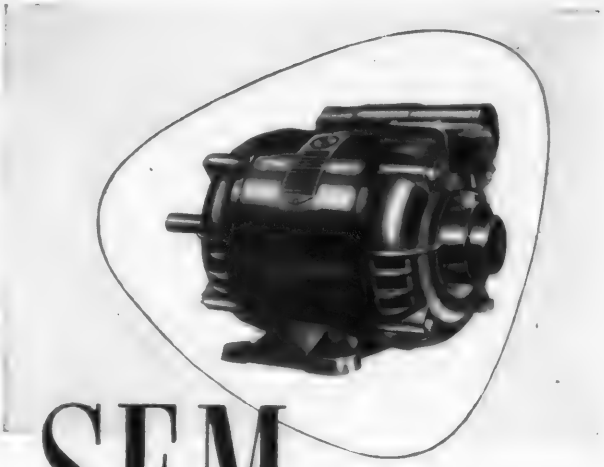

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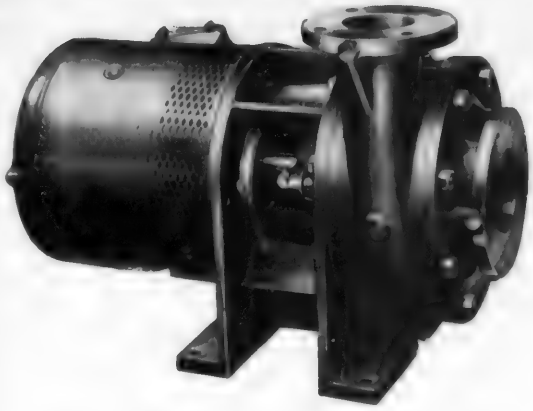

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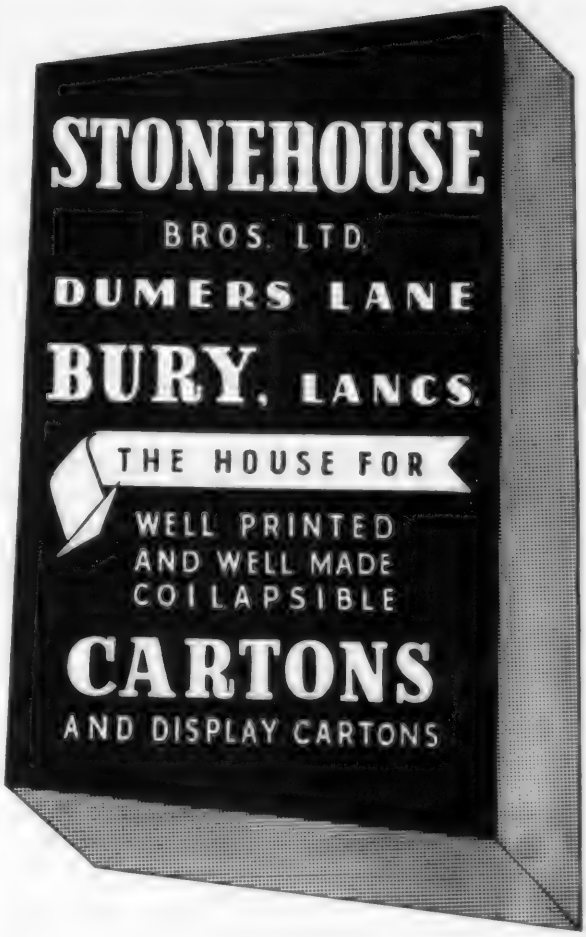

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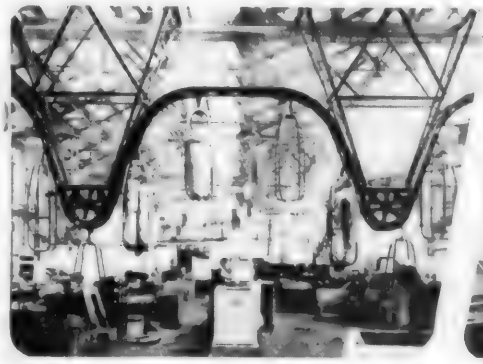

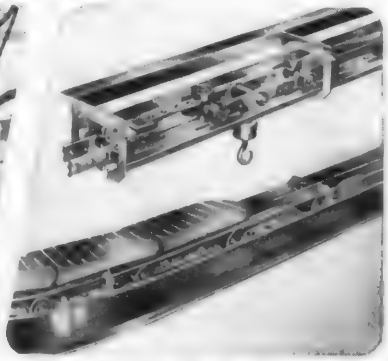

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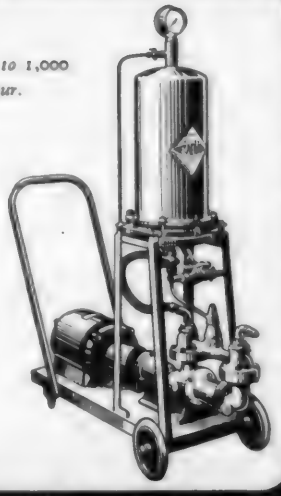

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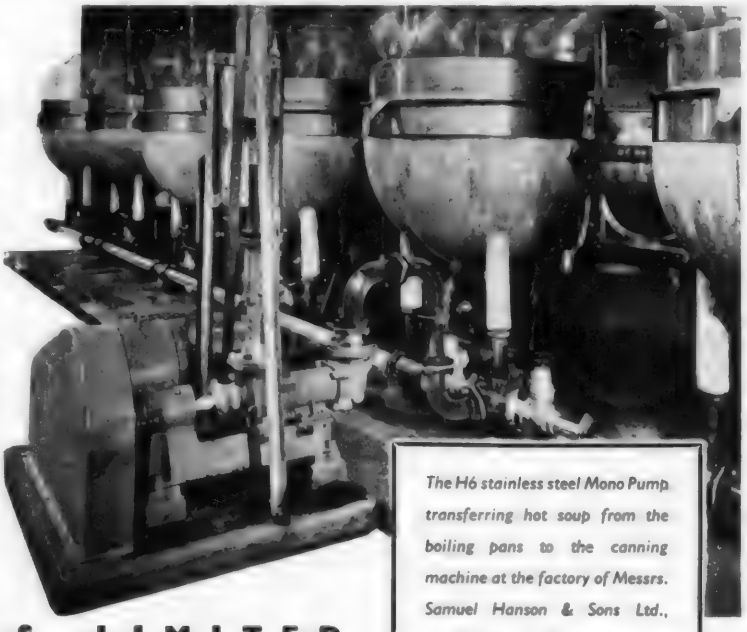

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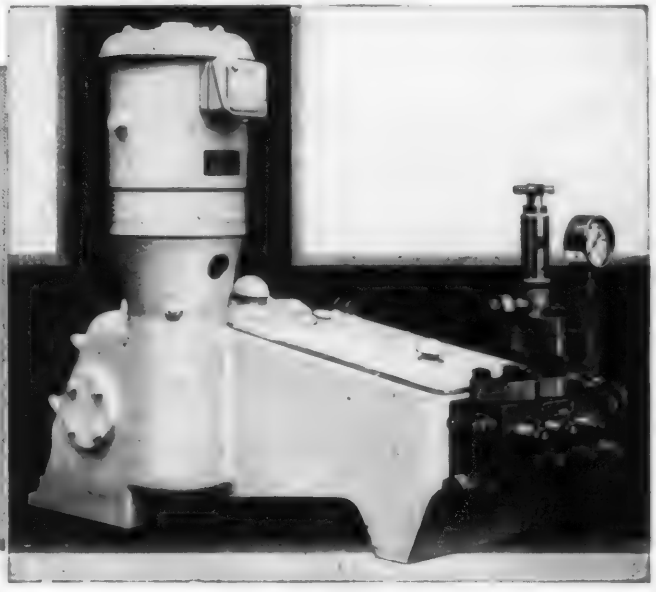

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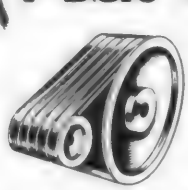

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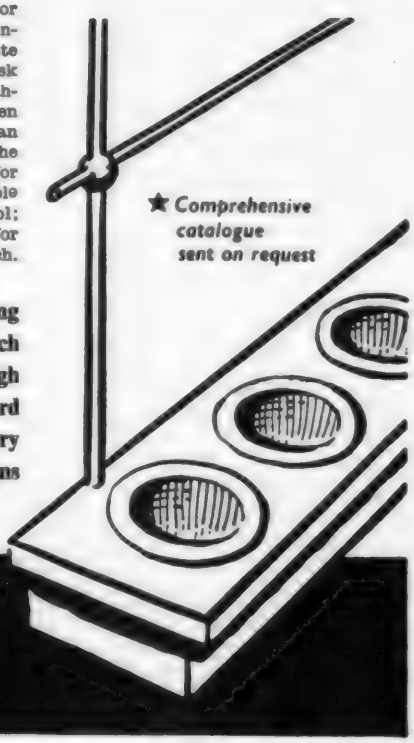

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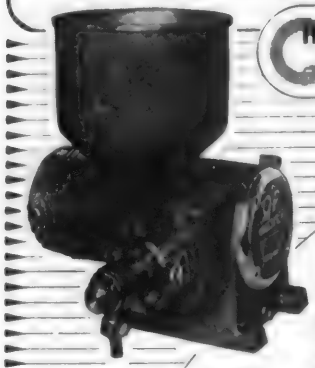

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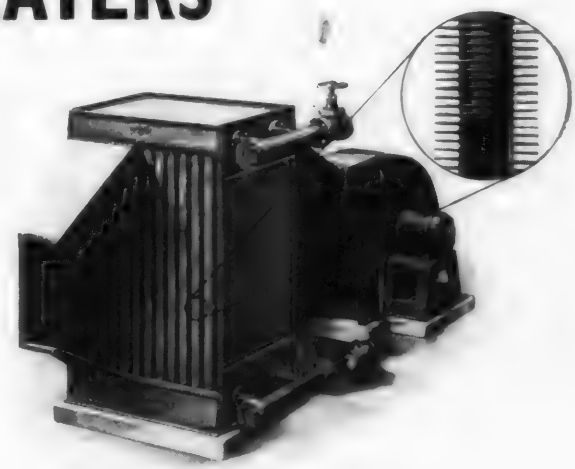

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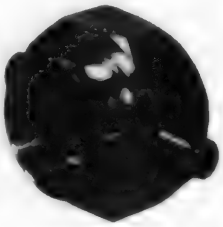

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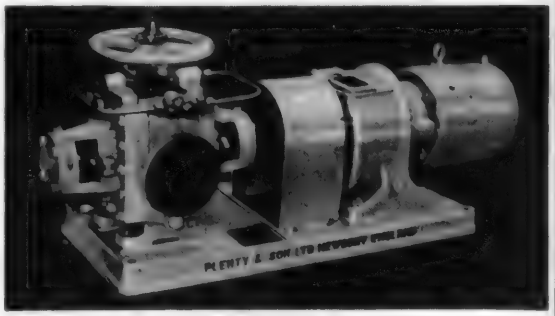

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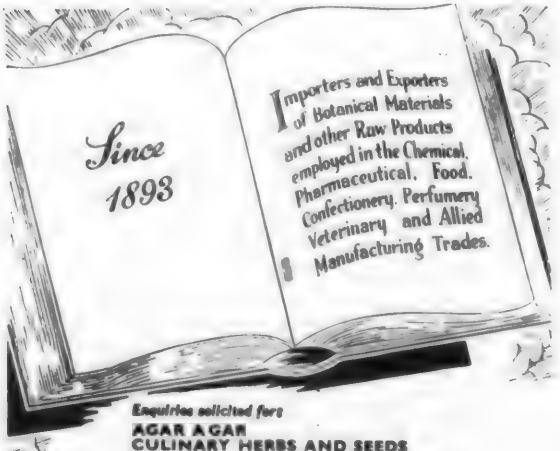
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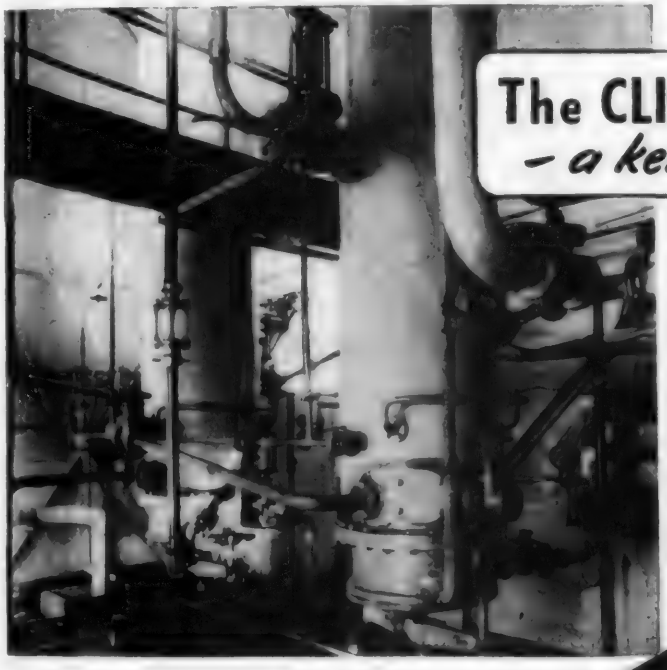

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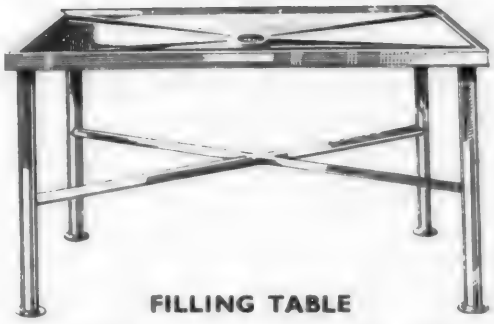

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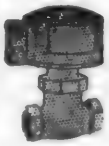

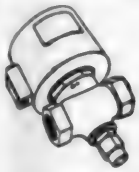

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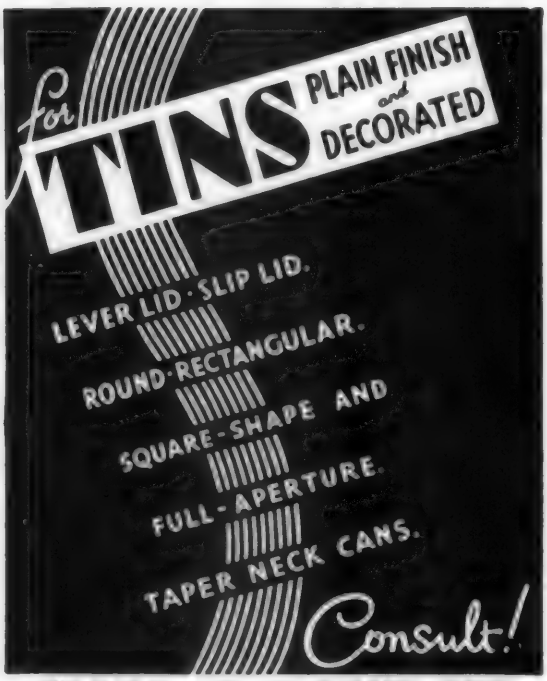

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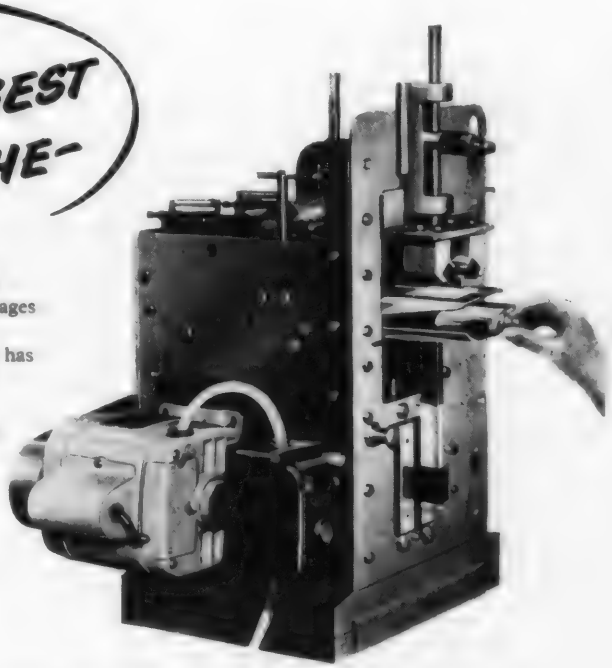

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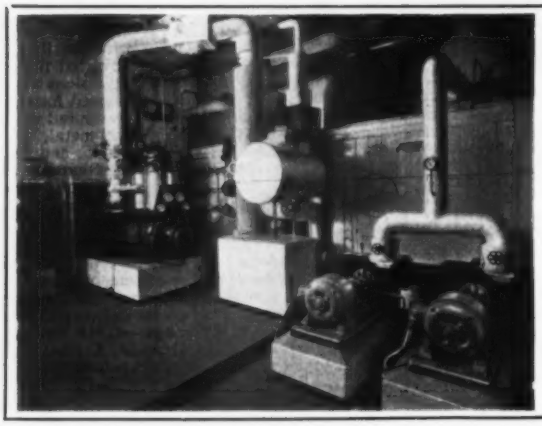

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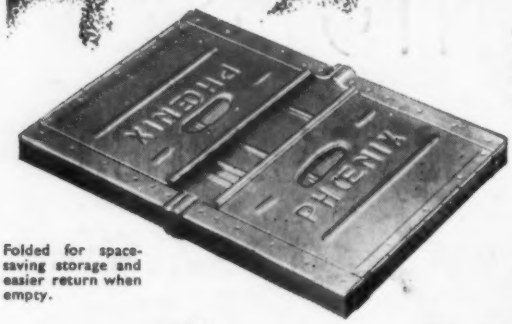

Folded for space-saving storage and easier return when empty.

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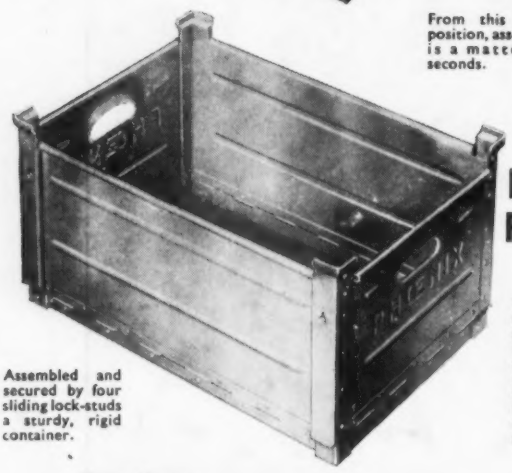

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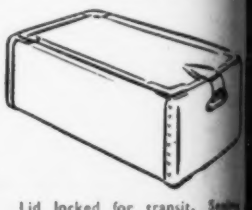
Lid fitted in seconds to lock either end.



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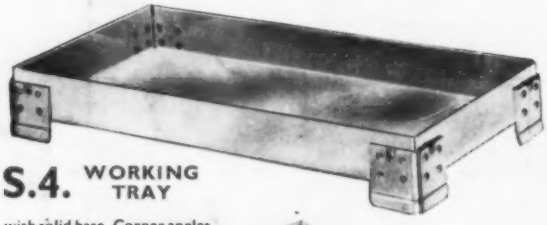

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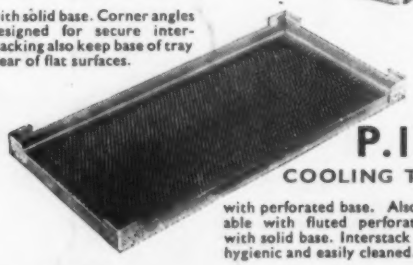

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